

Green Growth Assessment & Extended Cost Benefit Analysis

A Handbook for Policy and
Investment Decision Makers



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Foreword

Sustainable development is an important guiding principle in our economic development. We need to grow the economy in a way that achieves the three pillars of sustainable development: human development, economic progress and environmental protection. In other words, we need to enter the path of green growth in order to meet our domestic Nawa Cita priorities and contribute to the global Sustainable Development Goals (SDGs) as well as the recent climate agreement at the UNFCCC COP21 in Paris.

Green growth objectives need to be adopted in key sectors of our economy. In the energy sector, we have already started to phase out fuel subsidies and are diversifying to include clean and renewable energy in the energy mix. In our efforts to improve connectivity, we need to increase the number of green infrastructure projects, especially in the maritime sector and urban mass transportation. In the forest sector, we need to improve spatial planning, best sustainable harvest practices, and law enforcement to guide land use activities.

Since 2013 the Government of Indonesia - GGGI Green Growth Program has engaged stakeholders to develop a systematic framework to integrate green growth objectives into economic planning in Indonesia. Through the Program, in collaboration with the Coordinating Ministry of Economic Affairs, the Green Growth Assessment Process (GGAP) and extended Cost Benefit Analysis (eCBA) were developed as analytical tools, to provide a qualitative and quantitative analysis of the economic, social and environmental impacts of projects. When applying these tools, national and subnational government as well as investors will have a better understanding of, not only the costs, but also the benefits associated with green growth-oriented policy and technological interventions.

This handbook provides recommendations to integrate green growth assessment tools into Indonesia's existing economic and environmental planning and regulatory processes. I hope it will be useful to policymakers, investors and the wider public when planning and shaping investment projects in Indonesia.

To minimize and avoid social and environmental impacts, I encourage all investment projects to systematically apply green and efficient technologies as well as best practices, in order to optimize the broader environmental and social benefits to the people of Indonesia and the global community. These tools will help us move in this direction.

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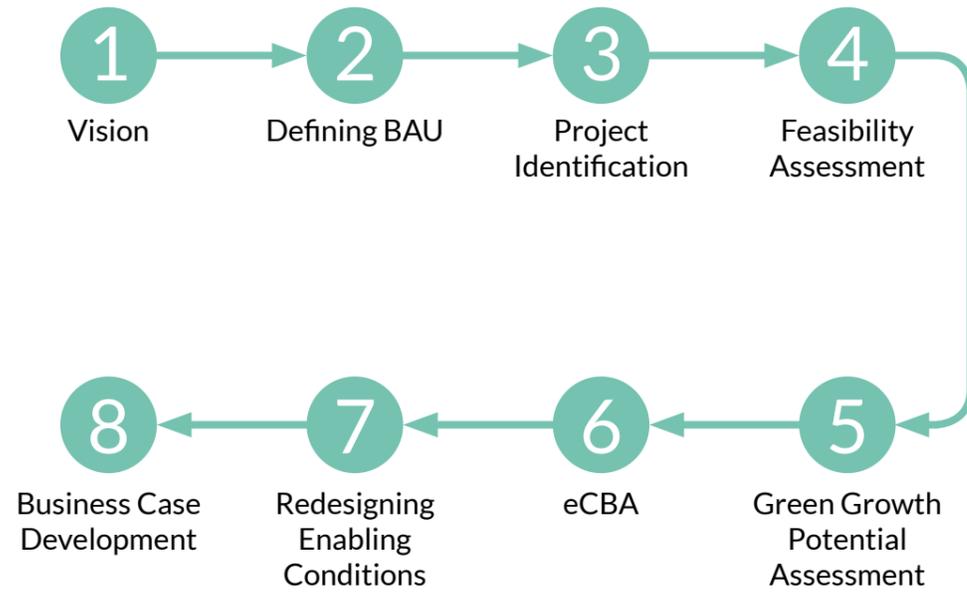
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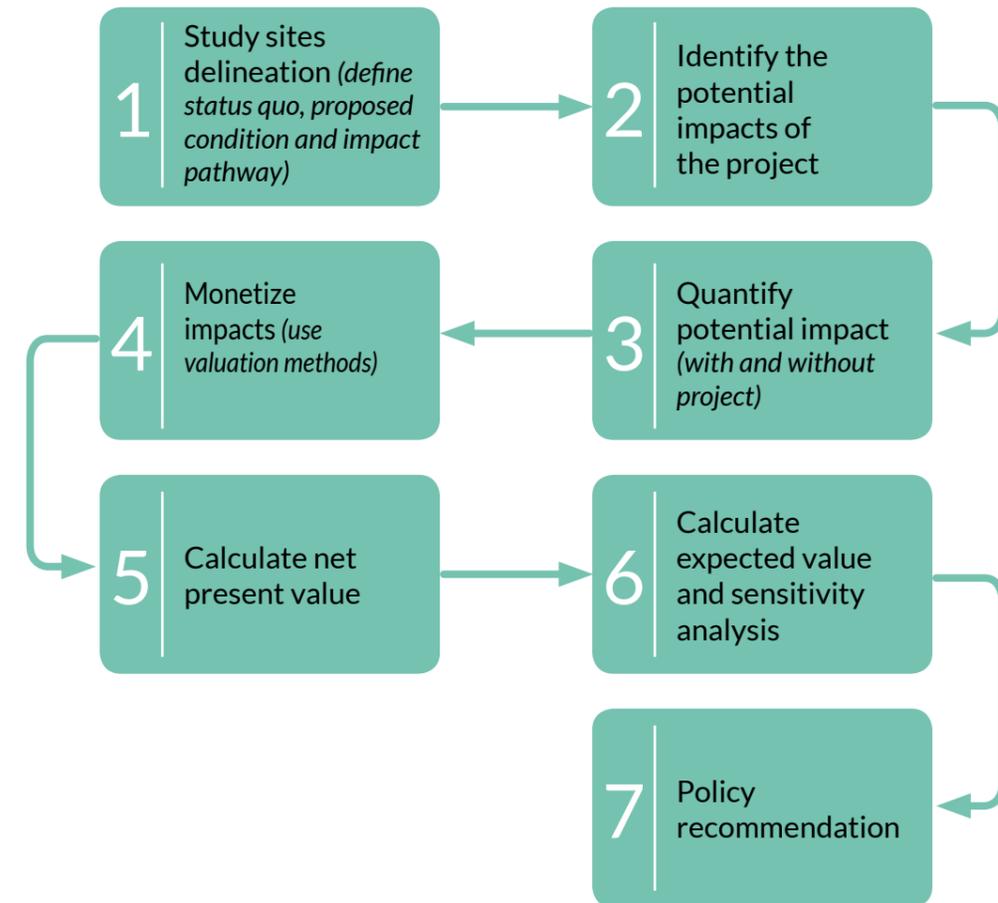
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The Green Growth Assessment Process



The Extended Cost Benefit Analysis Process



Glossary

Acronym	Explanation
AMDAL	Environment Impact Assessment
Bappenas	National Planning and Development Agency
BAU	Business As Usual
BCR	Benefit-Cost Ratio
BMP	Best Management Practices
c.i.f	Cost insured freight
CCBA	Climate, Community and Biodiversity Alliance
CER	Certified Emission Reduction
CO2	Carbon Dioxide
CPI	Consumer Price Index
CPO	Crude Palm Oil
eCBA	Extended Cost Benefit Analysis
ERC	Ecosystem Restoration Concession
f.o.b	Free on board
FFB	Fresh Fruit Bunch
GDP	Gross Domestic Product
GIMS	Green Industry Mapping Strategy
GGAP	Green Growth Assessment Process
GGF	Green Growth Framework
GGGI	Global Green Growth Institute
GHG	Green House Gas
GoI	Government of Indonesia
ha	Hectare
HCV	High Conservation Value

	<i>Hutan Produksi</i>
HP	Production Forest Concession
	<i>Hutan Produksi Konversi</i>
HPK	Production Forest Concession: Convertible
	<i>Hutan Tanaman Industri</i>
HTI	Production Forest Concession: Industrial Timber
	<i>Hak Pengusahaan Hutan</i>
HPH	Production Forest Concession: Selective Logging
IDR	Indonesian Rupiah
IPB	Bogor Agricultural University
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
IUP-PAN-KARBON	Business License for Carbon Sequestration and/or carbon storage
IUPHHK-RE	Ecosystem Restoration Concession
Kalteng	Central Kalimantan
KEK	Special Economic Zone
KFCP	Kalimantan Forest and Climate Partnership
KLH	Ministry of Environment
KSN	Strategic National Zone
kWh	Kilowatt hour
LCOE	Levelized Cost of Electricity
LULUCF	Land Use, Land Use Change and Forestry

Kemehut	Ministry of Forestry
MP3EI	Master Plan for the Acceleration of Economic Development
MSL	Mean Sea Level
Mt	Megatonne (<i>1 million tonnes</i>)
MtCO2	Megatonne Carbon Dioxide
MTHW	Mixed Tropical Hardwood
NPV	Net Present Value
NTFP	Non-Timber Forest Products
PDD	Project Design Document
PES	Program for Ecosystem Services
PKS	Palm Kernel Shells
PPP	Public Private Partnership
PT REKI	Ecosystem Conservation and Restoration Indonesia Ltd.
RAN/D-GRK	National/Regional Action Plan for Reducing Greenhouse Gas Emissions
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RMU	PT Rimba Makmur Utama
RPJMD	Region Medium Term Development Plan
RPJMN	National Medium Term Development Plan
RSPO	Roundtable on Sustainable Palm Oil
SDR	Social Discount Rate
SOC	Social Opportunity Cost
tCO2	Tons of Carbon Dioxide

TEV	Total Economic Value
TNC	The Nature Conservancy
TV	Terminal Value
UNORCID	UN Office for REDD+ Coordination in Indonesia
VAT	Value Added Tax
VCS	Verified Carbon Standard
WACC	Weighted Average Cost of Capital

Chapter 1

Introduction

1.1 Environmental Decision Making

Policy makers in Indonesia understand that sustainable development is a multi-dimensional concept. This is reflected in the 2015-19 RPJMN, which focuses on priority targets set out under the Nawa Cita Agenda. Indonesia is also committed to the Sustainable Development Goals (SDGs), which includes a pledge to take immediate actions in combatting climate change and its impacts.

Moreover, Indonesia has submitted its Intended Nationally Determined Contribution (INDC) to the UN to support the global reduction of GHG emissions. In order to achieve these targets, policy makers have to find a way to maintain economic growth while, at the same time, achieving the three pillars of sustainable development: a) human development, b) economic progress, and c) environmental protection. This requires a balancing act that simultaneously aims for traditional growth objectives, such as increasing economic productivity and competitiveness as well as committing to significant environmental protection and climate mitigation targets.

That is why the environmental decision making process is important for decision makers in reaching the growth target, in addition to the need for sticking to the sustainable agenda and global commitments. Environmental decision making provides alternative methods for several conditions in which decision making is needed by stakeholders, ranging from macro development planning to micro projects.

1.2 Green Growth Concept

'Green Growth' is a means to achieve the multiple objectives of sustainable development. This entails promoting an inclusive and equitable growth that recognizes the value of natural capital, improves resilience, and builds local economies. It encompasses policy reforms that speed up structural and technological innovations in order to enhance greater resource efficiency throughout the whole economy. In doing so, any green growth-oriented economic strategy places a premium priority on the design of policy incentives which safeguard the natural environment and its ecosystem services. In short, reconciling environmental stewardship and economic growth objectives provide plenty of opportunities for innovative green investment.

On the macro level, a Roadmap to Delivering Green Growth is designed to provide a long-term vision for public policy. In consulting with stakeholders, five desired outcomes of green growth have been identified, and a pool of indicators is being developed to measure the progress in driving the Indonesian economy towards these outcomes. On the micro level, the Green Growth Assessment Process (GGAP) and extended Cost Benefit Analysis (eCBA) are used as planning tools to help design policy interventions and encourage the use of green technologies, in addition to best practices to ensure green growth outcomes of the investment projects.

1.3 Objectives

This handbook is an introductory guide for policy makers to apply the GGAP and eCBA in the planning process. Both tools provide an integrated framework to provide a qualitative and quantitative analysis of the economic, social and environmental impacts of the projects. Using results and empirical evidence from four technical studies conducted by the Green Growth Program, this handbook illustrates the basic concepts underlying the eCBA and the methods in its implementation.

The eCBA is a very useful quantitative tool to provide concrete monetary values attached to social and environmental externalities. These costs are often hidden, as they are rarely addressed in conventional financial cost benefit analysis when investors plan their projects. By filling this 'quantitative gap', policy makers will be able to use the eCBA as an instrument to demonstrate to the public that investing in green infrastructure projects will yield significant economic and social benefits.

Who will benefit from this handbook? Senior staff and policy makers in government involved in investment decision making, with no or little knowledge about green growth issues and planning tools, will find this book useful as an overview and introduction. Technical staff with some or extensive knowledge can use this handbook as a quick and accessible guide to decide whether they want to use eCBA as a planning tool in assessing projects, potentially complementing other evaluation tools. In cases where planners have commissioned projects that utilize eCBA, this guide can be useful for developing terms of references, monitoring progress, and validating findings of technical studies carried out by consultants.

This handbook is also suitable for non-government stakeholders, especially practitioners in private sectors interested in investing in green infrastructure projects. Ultimately, this book is also of interest for the wider public and communities affected by infrastructure projects, as it will contribute to understanding the dimension of both the costs and benefits associated with green growth-oriented policy interventions.

At this stage, the GGAP and the eCBA are only demonstration tools. Nevertheless, we hope this handbook will showcase the potential benefits of using GGAP and eCBA as analytical methods, showing policy makers the relevance of these tools as an integrated part of Indonesia's economic and environmental planning process.

1.4 The Outline of the Handbook

This handbook consists of five chapters, described in more details as follows:

- Chapter 1 introduces the book content;
- Chapter 2 explains the green growth frameworks;
- Chapter 3 gives an overview of methods for environmental decision-making processes, which include cost effectiveness analysis, cost benefit analysis, multi-criteria analysis and safe minimum standards;
- Chapter 4 provides a detailed description of the extended cost benefit analysis method;
- Chapter 5 discusses several environmental valuation techniques which can complement the green growth and eCBA framework.

Chapter 2

Green Growth Framework



2.1 Introduction

Development has had positive impacts on improving the quality of life worldwide. The World Bank (2012) shows that in the last 20 years the global development has succeeded in both reducing poverty in the world and increasing global income. According to the Millennium Development Goals (MDGs) report, the number of people living with under \$1.25 per day decreased significantly from 1.9 billion in 1990 to 836 million in 2015. Other MDGs indicators have also increased significantly. Therefore, the development targets were expanded from eight goals with 21 targets focusing on social issues, including poverty and health, to 17 goals and 169 targets covering sustainable development.

Improvement of living standards causes a lot of pressure on natural resources and the environment, creating negative externalities. According to the Millennium Ecosystem Assessment (2003), 15 of the 24 ecosystem services degraded or were unsustainably exploited, while the consumption of non-renewable natural resources, such as minerals and metals, continued to rise. In 15 years, 40 percent of the people worldwide are predicted to lose access to clean water, assuming the continuation of the current consumption patterns. On top of that, the increased concentration of CO₂ in the atmosphere is also intensifying the risk of climate change where the temperature rises (Everett et al., 2010).

The discourse on whether it is possible to achieve economic growth without degrading the quality of the environment is related to the idea that economic growth will continue to cause depletion of natural resources and environmental degradation, and should be prevented from persisting indefinitely. Stern et al. (1996) even argued against the Kuznets curve theory (Barbier, 1997; Bhattarai & Hammig, 2001; Carson, Jeon, & McCubbin, 1997; Cole, Rayner, & Bates, 1997; Grossman & Krueger, 1991) that links an increase in Gross Domestic Product (GDP) to an increase in environmental degradation, a trend that is reversed after a certain income level has been achieved. Stern et al. (1996) stated that this concept is very dependent on an economic model, where there is no feedback from the environmental quality on the production, and trade has a neutral effect on the degradation of the environment. Once this assumption is negated, the Kuznets curve theory does not apply.

The Indonesia case shows that the Kuznets curve cannot be proven empirically. Indonesia's economy ranks 8th in the world with a total GDP of US\$2,839 billion, based on GDP Purchasing Power Parity (PPP), and ranks 16th for nominal GDP, based on the version by statistictimes.com (IMF, 2015). This is due to the significant growth in Indonesia during the 1970s until the

1990s. However, if we look at the discrepancy of circumstances across generations, where the poverty rate has increased by 20 percent, it can be inferred that the number of underprivileged citizens has since doubled (SUSENAS, 2015). Furthermore, the Gini coefficient increased sharply in the last five years from 0.42 to 0.43 in 2016 (BPS, 2016), whereas informal employment has remained at its current state – 60 percent of the total labor force since 2000 (SUSENAS, 2000). Meanwhile, the level of malnutrition characterized by abnormal growth was at 37 percent in 2013, among the lowest in Southeast Asia. We are also facing a low school enrollment ratio, an average of 8.4 years of schooling.

Increasing the GDP nominally and in PPP did not entail improvements in environmental quality. The data shows that a plantation in Kalimantan is projected to contribute 18-22 percent of emissions (Carlson et al., 2013), while losses caused by traffic congestion in Jakarta reached IDR 65 trillion per year (The Jakarta Post, 2015). This suggests that there is something wrong with the existing development pattern, both in Indonesia and globally. The concept of sustainability is overlooked in existing systems, where development cannot face the challenge of the present without compromising the ability of future generations to meet their needs (UN, 1987).

People are now beginning to realize that the earth's limited resources will become a barrier to future economic growth. The use of natural resources and the environment in a sustainable manner will lead to consistent and sustainable economic growth. Thus, we must start to do something to reduce the costs of economic growth, where it will be greater than the costs incurred to make the effort.

One sustainable development pattern today, which was initiated by the World Bank, is the concept of inclusive green growth. This concept refers to a pattern of "improvement of coordinated economic growth between environmental sustainability, poverty reduction, social inclusion that is driven by sustainable development, and global resource utilization" (GGGI, 2016). OECD (2013) defines green growth as economic growth approaches that promote human development, while ensuring that natural assets will continue to provide natural resources and environmental services in support of sustainable development. The concept of green growth is an operational concept of sustainable development, so that it can be directly used as guidance for policy makers.

The concept is expected to lead the development of the region to the right direction, resulting in efficiency in the use of natural resources and environmental services, as well as reducing emissions that can negatively impact the environment and threaten long-term economic sustainability. The framework



that is introduced in this concept of green growth aims to move the economy toward sustainable development by focusing on five dimensions of green growth: economic, social, and environmental resilience; reduction of greenhouse gases emission; sustainable economic growth; fair and inclusive growth; and healthy natural capital and environmental services.

Policies that promote green growth need to be founded on a good understanding of the determinants of green growth and the trade-offs or related synergies. They need to be supported with appropriate information on the results obtained. This requires indicators that can send a clear message to the policy makers and the public at large. The indicators must be embedded in a conceptual framework, chosen according to a well-defined criteria, and based on comparable international data (OECD, 2014). Thus, to evaluate the scope of the implementation of green growth development, the indicators as a measurement tool are needed. So far, GGGI has developed a proposal of green growth indicators that can be used to measure the implementation of the concept of green growth that can be applied to the development of Special Economic Zones (SEZs) at the provincial level and national levels. Green growth indicators will be used to analyze the impact of strategic economic development, such as the construction of SEZs.



2.2 Concept, Definition, and History of Green Growth Development

Green growth is a concept initially developed by the United Nations and then developed further by various international organizations, including the OECD and recently GGGI. The concept of green growth cannot be separated from the context of sustainable development, green economy, and low carbon development. As described by Allen & Clouth (2012), the notion of green economy, green growth, and low carbon development has been discussed and analyzed over the past decades by economists and academics who study the science of ecological economics and, therefore, is not a new concept. Scott et al. (2013) state many definitions that explain the concept of green growth. However, in essence, it illustrates the growth strategy that brings together economic, environmental, social, and technological advances. Green growth encourages the efficient use of natural resources, use of clean technology, minimization of pollution and other environmental impacts, resilience in natural disasters, and inclusivity in terms of involving various elements of development, including gender equality and groups with disability.

Several other definitions of green growth that encompass a comprehensive account on the concept mainly reflect on the similarities and differences between existing schemes. Most definitions of green growth state that sustainable economic progress is crucial. However, there are differences in how they set economic progress, such as improved quality of life versus

economic growth. Some notable definitions are as follows (World Bank, 2014):

- Green economy is “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2012).
- Green economy is described as an economy in which its growth and environmental responsibility work together in a mutually reinforcing fashion while supporting progress on social development (Commerce, 2012).
- Green growth means fostering economic growth and development while ensuring that natural assets continue to provide resources and environmental services on which our well-being relies. Green growth focuses on the synergies and trade-offs between environmental pillars and sustainable economic development (Green Growth Knowledge Platform, 2013).
- Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyze investment and innovation, which will underpin sustainable growth and give rise to new economic opportunities (OECD, 2011b).

Jouvet & de Perthuis (2013) suggest that at large, green growth policies incorporate environmental factors in economic decision-making by considering the efficient use of resources, transforming the energy system, assessing natural assets in the calculation of the economy, and determining the price of environmental externalities. On the other hand, Smith et al.

(2013) and The World Bank (2012) concur that the important issue in the concept of green growth is the relationship between social development and economic sustainability. Some literatures (Lee, 2011; OECD, 2013; The World Bank, 2012; UN ESCAP, n.d.; ADB, 2012) view green development as a condition that must exist for sustainable development to be achieved. Green development must also be economically efficient due to its importance for future development, especially for developing countries because it will provide significant economic and social benefits.

The concept of green growth is derived from the idea that we will benefit from improved quality of the environment, as stated by OECD (2014) where nearly 80 percent of people in OECD member countries benefit from improved sanitation. Meanwhile, pollution, primarily air pollution, continues to generate a lot of negative externalities on societal health. This will in turn reduce productivity and lower economic growth. Green growth reasonably increases pollution mitigation, reduces the cost of the damage, and improves the economy in the long run.

Developments that implement green growth policies with pollution mitigation and engineering technology, innovation, and the appropriate use of economic instruments will provide economic opportunities for a better and more prosperous future, especially in terms of job vacancies and competitiveness. New economic opportunities will rise, for instance from sectors that produce goods and services which are already evolved and contribute significantly to the economy. Green growth also means development opportunities provided by international financial flows that promote greener growth through carbon trade, fossil fuel technology, clean energy,

etc. Furthermore, green growth can provide a chance to increase investors' confidence level and better environmental governance conditions (OECD, 2014).

Along with its development, the green growth established framework consists of the following five pillars:

01.  Social, economic, and environmental resilience
02.  Inclusive and equitable growth
03.  Greenhouse gas emission reduction
04.  Sustainable economic growth
05.  Healthy and productive ecosystems providing services

These five frameworks are keywords which will then be translated into green growth indicators and can be used as a tool to evaluate the implementation of green growth in various sectors of development.

Although this concept has been evolving over several decades, the green economy concept only gained political currency after the start of the monetary crisis in 2008. This concept has been implemented by some countries to boost growth in a more sustainable way. The economic crisis became the momentum to recall the importance of maintaining sustainable development strategy. Several countries implemented policies to stimulate growth by offering incentives for investment in renewable energy and green technologies. South Korea was the most advanced country in this regard and proposed a paradigm shift from growth based on fossil fuel to one based on renewable energy sources.

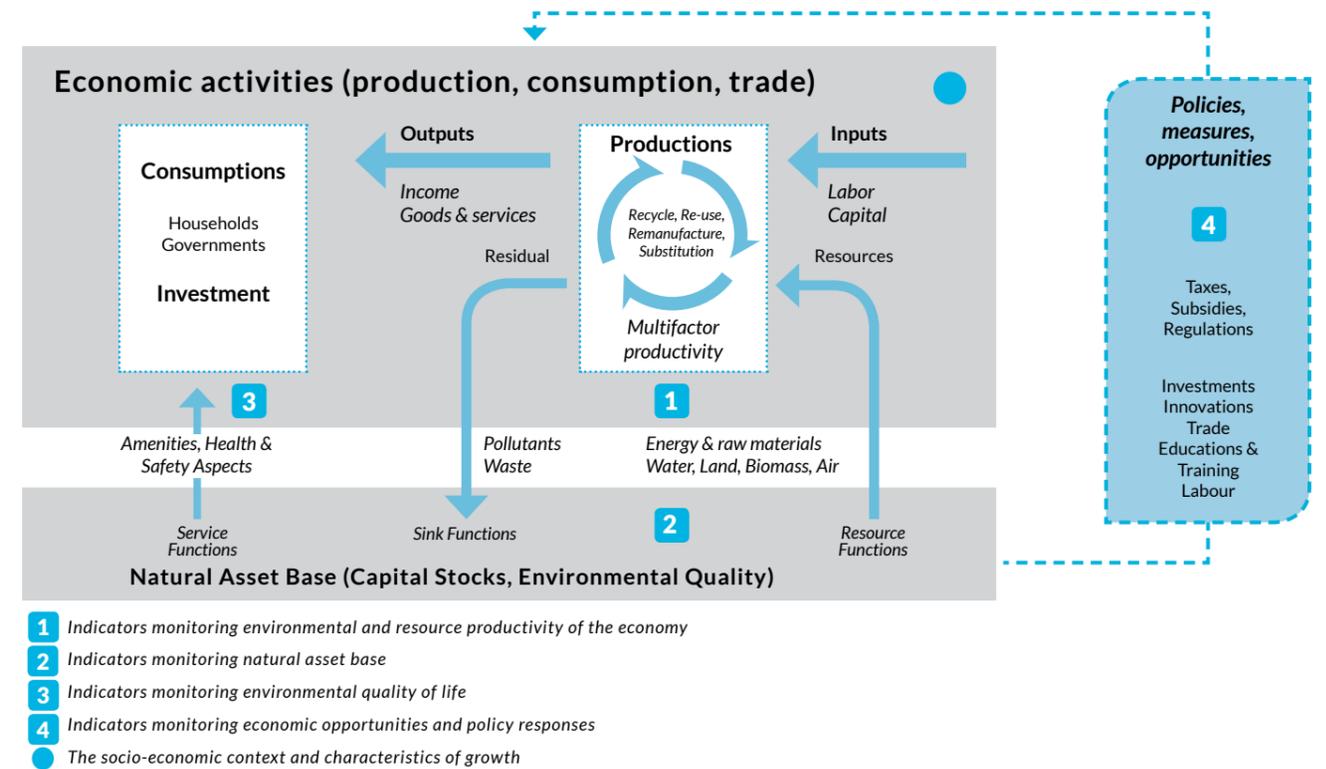
UNEP launched green growth initiatives in October 2008. The concept of green growth also rose due to the climate change mitigation policy that was an important theme at the UN Framework Convention on Climate Change (UNFCCC) held in Copenhagen in 2009. In June that year, ministers

from 34 countries signed a declaration of green growth. They are determined to strengthen the efforts to pursue green growth strategies as part of their response to the global crisis. They also support the OECD's mandate to develop green growth strategies, integrating economic, environmental, social, technology within the framework of comprehensive development. The strategy to support the OECD's mandate is part of the OECD's contribution to the RIO+20 Conference in June 2012.

Green Growth is a global concept implemented by many countries, including Indonesia.

The declaration to replace the Millennium Development Goals (MDG), which ended in 2015, with SDGs – a more comprehensive concept – is a rather strategic output from the Rio+20 Conference.

Figure 1. Measurement Framework for Green Growth (OECD, 2011b)



2.3 Development of Green Growth Indicators

As mentioned in the introduction, the development of the green growth concept is meaningless without a set of indicators to evaluate the implementation of policies (OECD, 2014). Besides, the policies using the concept of green growth must be equipped with a mindset and a good understanding of the determinant factors of green growth, complete with dynamic synergies and tradeoffs. Thus, accurate information about the results and progress based on the implementation of green growth scheme is needed, in the form of indicators.

Ideally, these indicators should be selected based on the same criteria and be universally acceptable, while at the same time adjustable to fit local and regional contexts. In terms of the development of these green indicators, OECD's 2011 report on "Towards Green Growth:

Monitoring The Progress" has developed an approach to monitor the progress of green growth. This concept involves a conceptual measurement that combines the main features of green growth with basic accounting principles and the Pressure-State-Response model for environmental assessment reporting. The measurement framework is centered on the function of economic production as well as consumption, describing the interaction between the economy, natural assets, and policy implementation (Figure 1). This construction is intended to identify the sources of green growth and help identify indicators that are relevant to policy makers.

The OECD provides a framework for the selection of indicators



Table 1. Key Principles in Selecting Green Growth Indicators

No	Key Principles	Description
1	Policy Relevance	Indicators should have a balanced coverage of green growth key features with a focus on common interests for OECD member and partner countries.
		Easy to interpret and be transparent. Users should be able to analyze the significance of values associated with the indicators and how those change over time.
		It can be a basis for comparison between countries.
		It can be adapted to different national contexts and analyzed at different levels of detail or aggregation.
2	Analytical	Indicators should be analyzed and useful from the consensus validity.
		Indicators should be able to be correlated with the economy and the environment modeling and prediction.
3	Measurable	Indicators should be based on data availability or can be provided at a reasonable cost, be good in quality, and can be updated regularly.

Source: (OECD, 2011b)

OECD¹ has developed comprehensive green growth indicators and written the scores for each indicator of every country, including Indonesia. The following table contains the proposed indicators by OECD in the early development of green growth indicators cited from OECD (2011b). As shown in the table, groups of major indicators and coverage are divided into socio-economic context and growth characteristic—which are

the main economic indicators— followed by environmental and resource productivity, natural asset base, quality of the environment, economic opportunities, as well as policy responses. All dimensions are translated to the main indicator groups that consist of several indicators, along with possible coverage.

Table 2. Overview of Key Indicators Groups and Scope of Green Growth

Main Indicator Groups	Topics Covered
The Socio-Economic Context and Characteristics of Growth	
Economic growth	Economic growth and structure
Productivity and competitiveness	Productivity and trade
Labor markets, education, and income	Labor markets (employment/unemployment)
Environmental and Resource productivity	
Carbon and energy productivity	1. CO2 productivity (demand-based, production-based) 2. Energy productivity
Resource productivity	3. Material productivity (demand-based, production-based) Non-energy materials, waste materials, nutrients 4. Water productivity
Multi-factor productivity	5. Multi-factor productivity reflecting environmental services
Natural asset base	
Renewable stocks	6. Freshwater resources 7. Forest resources 8. Fish resources
Non-renewable stocks	9. Mineral resources

¹http://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH



Main Indicator Groups	Topics Covered
Biodiversity and ecosystems	10. Land resources
	11. Soil resources
	12. Wildlife resources
Environmental quality of life	
Environmental health and risks	13. Environmentally induced health problems and related costs
Environmental services and amenities	14. Exposure to natural or industrial risks and related economic losses
	15. Access to sewage treatment and drinking water
Economic opportunities and policy responses	
Technology and innovation	16. R&D of importance to Green Growth
	17. Patents of importance to Green Growth
	18. Environment-related innovation
Environmental goods and services	19. Production of environmental goods and services
International financial flows	20. International financial flows of importance to Green Growth
Prices and transfers	21. Environment-related taxation
	22. Energy pricing
	23. Water pricing and cost recovery
Regulations & management approaches	Indicators to be developed
Training & skill development	

Sources: (OECD, 2011b)



Table 3. National Green Growth Indicators

The final indicators to be referred by local, provincial and national governments are as follows:

DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
ECONOMIC GROWTH	1	GDP	IDR Trillion Constant Price 2010	A, B, C, D	8	Directly available from publication every year	WORLDBANK
	2	GDP per capita	IDR Thousand	A	8	Directly available from publication every year	BPS
	3	Number of new patent/year	Number	A	9	Available, yearly (2014, 2015)	DJKI
	4	Genuine saving	(% of GNI)	A	8, 12	Directly available from publication every year	WORLDBANK
	5	Green GDP	IDR Trillion	A	8, 12	Directly available from publication every year	BPS
	6	Industrial index	(GDP of industry/ GDP)	B, C, D	8	Available from publication every year	BPS
	7	Natural resource index	(GDP of natural resources/ GDP)	B, C, D	12	Available from publication every year	BPS

DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
GHG EMISSION	8	GHG intensity of growth	Kg per PPP \$ of GDP	A, B, C, D	13, 7	Directly available from publication every year	WORLDBANK
	9	GHG per capita	Metric tons per capita	A, B, C, D	13, 7	Directly available from publication every year	BPS and INCAS
	10	Total GHGs/ year	Million metric tons CO2	A, B, C, D	13, 7	Directly available from publication every year	CIAT
	11	Renewable energy production	% of total energy	A, B, C, D	7	Available from publication every year	IEA
	12	Carbon intensity of electricity	Tons of CO2/KwH	A, B, C, D	13, 7	Available from publication every year	SDGs Center
	13	GHG from land use	Million tCO2-eq	A, B	13, 15	Directly available from publication every year	INCAS
HEALTHY & PRODUCTIVE ECOSYSTEM	14	Number of endangered marine species	Number	A, C	14	Directly available from publication	KKP
	15	Healthy coral reef area (s)	% of total area	A, B, C, D	14	Available, certain years (2005-2014)	COREMAP-LIPI
	16	Mangrove area (s)	Ha	A, C	14	Available, but certain years (2007, 2010-2012)	Bakosurtanal, SLHI
	17	Percentage of damaged coral reef (s)	% of total area	A, B, C, D	14	Available, certain years (2005-2014)	COREMAP
	18	EQI	EQI Index Score	A, B, C, D	11, 12, 13, 14, 15	Directly available from publication from 2009 until 2014	KLHK
	19	Deforestation rate	% per year	A, B, D	15	Directly available from publication every years (2005-2012)	KLHK
	20	Forest cover	% of total area	A, B, D	15	Directly available from publication every year (2005-2015)	WORLDBANK
	21	Total area of marine protected areas	Ha	A, B, C, D	14	Available from publication every year (2005-2013)	KKP/GIS Series
	22	Land conservation area	Ha	A, B, D	15	Available from publication few years (2005-2014)	SLHI
	23	Area of degraded land	Ha	A, B, D	15	Directly available from publication for a few years	KLHK
	24	Peatland	Ha	A, B	13, 15	Available, but certain year (2011)	BALITBANG Pertanian
25	Wet peatland area	Ha	A, B	13, 15	NA	-	



DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
INCLUSIVE & EQUITABLE GROWTH	26	Percentage of female employment in non-agriculture	%	A, B, C, D	5, 10	Available, yearly, need raw data access	WORLDBANK, BPS
	27	Percentage of female employment in agriculture	%	A	5, 10	Available, yearly, need raw data access	SAKERNAS
	28	Access to credit for SMEs	% of total credit	A, B, C, D	1, 8	Available, yearly (2011-2016)	Bank Indonesia
	29	Literacy rate	% of adult population	A, B, C, D	4	Directly available from publication every year	WORLDBANK,
	30	Gender gap in literacy rate	Ratio of female to male	A, B, C, D	5	Directly available from publication every year	WORLDBANK, DEPKES
	31	Measuring equality	Gini Coefficient	A, B, C, D	10	Directly available from publication every year	WORLDBANK, BPS
	32	Unemployment rate	%	A, B, C, D	8	Directly available from publication every year	BPS

DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
INCLUSIVE & EQUITABLE GROWTH	33	Mean years of schooling	Years	A, B, C, D	4	Directly available from publication every year	WORLDBANK, DEPKES, BPS
	34	Ratio of female to male with primary education	Ratio	A, B, C, D	5	Directly available from publication every year	SDGs Center
	35	Ratio of female to male with secondary education	Ratio	A, B, C, D	5	Directly available from publication every year	SDGs Center
	36	Ratio of female to male with tertiary education	Ratio	A, B, C, D	5	-	-
	37	Women unemployment rate	%	A, B, C, D	5, 8	Directly available from publication every year	WORLDBANK and ILO
	38	Percentage of households with access to clean water	%	A, B, C, D	6	Directly available from publication every year	BPS, DEPKES
	39	Percentage of households with access to sanitation	%	A, B, C, D	6	Directly available from publication every year	BPS
	40	Estimated life expectancy of women and men	Years	A, B, C, D	3, 5	Directly available from publication every year	BPS, WORLDBANK
	41	Estimated life expectancy of men	Years	A, B, C, D	3	Directly available from publication every year	BPS, WORLDBANK
	42	Estimated life expectancy of women	Years	A, B, C, D	3, 5	Directly available from publication every year	BPS, WORLDBANK
	43	Infant mortality	Number of deaths/ 1,000 births	A, B, C, D	3	Directly available from publication every year	BPS, DEPKES, WORLDBANK
	44	Maternal mortality ratio	Number of deaths/ 100,000 births	A, B, C, D	3	Directly available from publication every year (1990-2015)	WORLDBANK
	45	% population without access to electricity	% of total population	A, B, C, D	7	Directly available from publication every year	WORLDBANK
	46	Agriculture value added per worker	Constant 2010 US\$	A, B	2	Not directly available. Only available in agricultural household (2000, 2005 and 2008)	Population in agriculture sector is difficult to identify, employed yes
	47	Natural Resource Conflicts	Number	A, B, C, D	16	Available in 2015	Humawin

DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
INCLUSIVE & EQUITABLE GROWTH	48	Internet access per person	%	A	9	Directly available from publication every year	WORLDBANK and United Nations Population Division
	49	a. The poor with national poverty lines b. The poor and the poverty line of US\$ 1.90 per day	%	B, C, D	1	Directly available from publication every year	WORLDBANK and BPS
RESILIENCE	50	Number of floods	Number of event	A, B, C, D	11, 13	Available, annually	BNPB
	51	Population affected by flooding	Number of people	A, B, C, D	11	Available, annually	BNPB
	52	Access to healthcare	Doctors/1,000 people	A, B, C, D	3	Directly available from publication every year	Depkes
	53	Fish consumption/production	%	A, C	2	Available from publication every year	KKP
	54	Food crop area(s)	Ha	A, B, D	2	Directly available from publication every year	FAO
	55	Wetland area(s)	Ha	A, B	15	Available from publication certain years	RAMSAR Site Information Services
	56	Cultivated palm oil area(s) by smallholder farmer(s)	Ha	A, B	10	Available, only for Cultivated area palm oil in Ha	Diagnostic study on Indonesian Oil Palm Smallholders (2013), Report Overview of Indonesian oil palm small holders Farmers, (2013), Statistical Palm Oil Estate Crops 2013-2015 of the Directorate General of Estate Crops
	57	Smallholder Palm Oil Farmer productivity	Tons	A, B	10	Directly available from publication every year, Only Available for production in Tons	Statistical Palm Oil Estate Crops 2013-2015 of the Directorate General of Estate Crops
	58	Forest Fires	Ha	A, B, C, D	13, 15	Available from publication certain years	Directorate General of Forest Protection and Nature Conservation
	59	Peatland fires per year	Ha	A, B, C, D	15, 17	Available from publication certain years	INCAS-KLHK

DIMENSION	NO	INDICATORS	UNIT	THEME*	SDGs GOALS	ASSESSMENT STATUS	SOURCE
RESILIENCE	60	Landslides	Number of event	A, B, C, D	11,13	Available from publication every year	BNPB
	61	Number of illegal fishing incidents	Number of event	A, C	14	Available from publication (unpublished data)	KKP
	62	Threatened mangrove area(s)	Ha	A, B, C, D	14	Available from publication certain years	SLHI
	63	Corruption Perception Index (CPI)	Score	A, B, C, D	16	Directly available from publication every year	TRANSPARENCY INTERNATIONAL

Notes:

* The theme of each indicator based on GGGI's short list is coded as follows:

A = National Baseline Indicators

B = Indicators EK-CK

C = Maritime

D = Ecotourism

Table 4. Provincial Green Growth Indicators

DIMENSION	NO	INDICATORS	UNIT	THEME	SDGs GOALS	ASSESSMENT STATUS	SOURCE
ECONOMIC GROWTH	1	GRDP	IDR million constant price 2010	B, C, D	8	Directly available from publication every year	BPS
	2	Total GDRP per capita	IDR	B, C, D	8	Directly available from publication every year	BPS
	3	Number of new patents/year	Number	A	9	-	-
	4	Genuine savings	(% of GNI)	A	8,12	Available in certain years (2005)	SDGs Center
	5	Green GDP	IDR trillion	A	8,12	Available in certain years (2005)	SDGs Center
	6	Industrial Index	(GRDP of industry sector/GRDP)	B, C, D	8	Directly available from publication every year	BPS
	7	Natural Resources Index	(GRDP of natural resources or primary sector/GRDP)	B, C, D	12	Directly available from publication every year	BPS
GHG EMISSION	8	GHG intensity of growth	GHGs/GDP	B, C, D	13,7	Available, can be calculated from publication every year	INCAS KLHK and BPS
	9	GHG per capita	GHG/capita	B, C, D	13,7	Available, can be calculated from publication every year	INCAS KLHK and BPS
	10	Total GHGs/year	GHGs Tons/year	B, C, D	13,7	Directly available from publication every year	INCAS KLHK
	11	Renewable energy production	% of total energy	B, C, D	7	Not available, but electricity is available	Department of Energy and Mineral Resource of East Kalimantan (Distamben KALTIM)

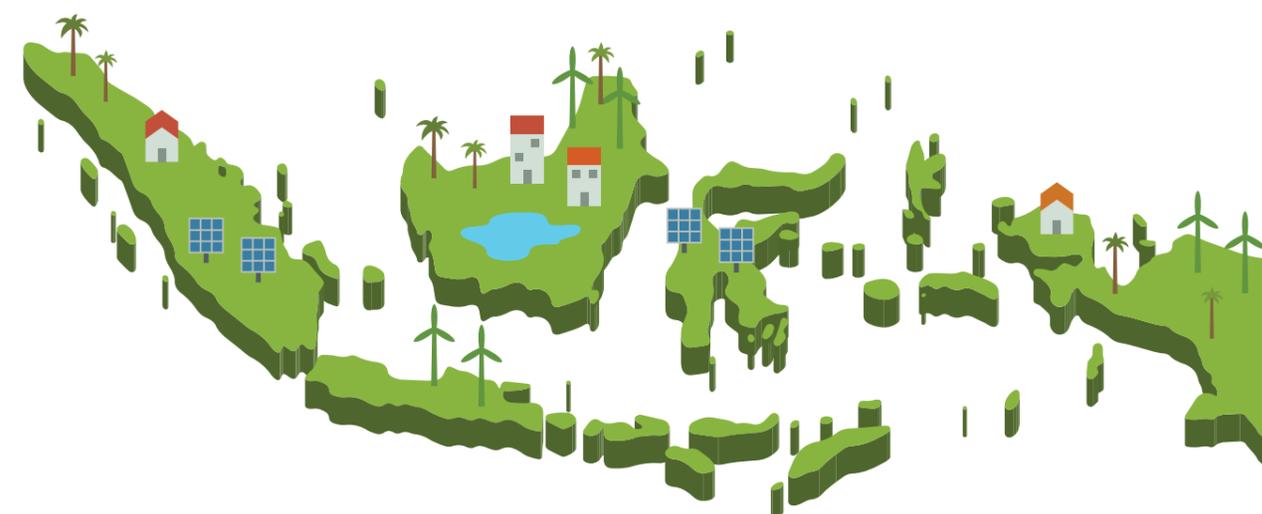
DIMENSION	NO	INDICATORS	UNIT	THEME	SDGs GOALS	ASSESSMENT STATUS	SOURCE	
HEALTHY & PRODUCTIVE ECOSYSTEM	12	Carbon intensity of electricity	Tons CO2/KWh	B	13, 7	Calculated	SDGs Center	
	13	GHG from land use (GHG = Greenhouse Gas)	Million tCO2-eq	B	13, 15	Directly available from publication every year	INCAS KLHK	
	14	Number of endangered marine species	Number	A, C	14	-	-	
	15	Healthy coral reef area(s)	% of total area	A, B, C, D	14	Available certain years (2014)	SLHI	
	16	Mangrove area	Ha	C	14	Available in few years	DKD and SLHI	
	17	Percentage of damaged coral reef	% of total area	A, B, C, D	14	Available certain years (2014)	SLHI	
	18	EQI (Environmental Quality Index)	EQI Index Score	B, C, D	11, 12, 13, 14, 15	Available (2009-2014)	KLHK	
	19	Deforestation rate	%per year	B, D	15	Directly available from publication every year	KLHK	
	20	Forest cover	% of total area	B, D	15	Directly available from publication every year	BPS	
	21	Total area of marine protected areas	Ha	B, C, D	14	Available	Bakosurtanal, KKP	
	22	Land conservation area(s)	Ha	B, D	15	Directly available from publication every year	SLHI	
	23	Area of degraded Land	Ha	B, D	15	Available, annually	BPS	
	24	Peatland	Ha	B,C,D	13, 15	Available Certain Year (2011)	Agency for Agricultural Research and Development	
	25	Wet peatland area(s)	Total land area	B	13, 15	-	-	
	INCLUSIVE & EQUITABLE GROWTH	26	Percentage of female employment in non-agriculture sectors	%	A, B, C, D	5, 10	Access to raw data needed	SAKERNAS
		27	Percentage of female employment in agriculture sectors	%	A	5, 10	Access to raw data needed	SAKERNAS
		28	Access to credit for SMEs	% of total credit	B, C, D	1, 8	Available in certain years (2013,2014)	Bank Indonesia
		29	Literacy rate	% of adult population	B, C, D	4	Directly available from publication every year	SDGs Center
		30	Gender gap in literacy rate	Ratio of female to male	B, C, D	5	Directly available from publication every year	SDGs Center
		31	Measuring equality	Gini Coefficient	B, C, D	10	Directly available from publication every year	BPS

DIMENSION	NO	INDICATORS	UNIT	THEME	SDGs GOALS	ASSESSMENT STATUS	SOURCE
INCLUSIVE & EQUITABLE GROWTH	32	Unemployment rate	%	B, C, D	8	Directly available from publication every year	BPS
	33	Mean years of schooling	Years	B, C, D	4	Directly available from publication every year	BPS
	34	Ratio of female to male with primary education	Ratio	A, B, C, D	5	Directly available from publication every year	SDGs Center
	35	Ratio of female to male with secondary education	Ratio	A, B, C, D	5	Directly available from publication every year	SDGs Center
	36	Ratio of female to male with tertiary education	Ratio	A, B, C, D	5	-	-
	37	Women unemployment rate	%	B, C, D	5, 8	Available in terms of % of women unemployment both in urban and rural areas (2009-2012)	BPS
	38	Percentage of households with access to clean water	%	B, C, D	6	Directly available from publication every year	BPS
	39	Percentage of households with access to sanitation	%	B, C, D	6	Directly available from publication every year	BPS
	40	Estimated life expectancy of women and men	Years	B, C, D	3, 5	Directly available from publication every year	BPS
	41	Estimated life expectancy of men	Years	B, C, D	3	Directly available from publication every year	BPS
	42	Estimated life expectancy of women	Years	B, C, D	3, 5	Directly available from publication every year	BPS
	43	Infant mortality	Number of death/ 1,000 people	B, C, D	3	Directly available from publication every year	Ministry of Health and BPS
	44	Maternal mortality ratio	number of death per 100k live births	B, C, D	3	Directly available from publication every year	Ministry of Health and BPS
	45	% population without access to electricity	% of total population	B, C, D	7	Directly available from publication every year	BPS KALTIM
	46	Agriculture value added per worker	GRDP Agriculture (Billion) per Worker (Person)	A, B	2	Available from year 2010 to 2013	BPS and Center for Agricultural Data and Information System
	47	Natural resources conflicts	Number	A,B,C,D	16	Available in 2015	Humawin
	48	Internet access per person	%	A	9	Available from year 2010 to 2013	SDGs Center

DIMENSION	NO	INDICATORS	UNIT	THEME	SDGs GOALS	ASSESSMENT STATUS	SOURCE
INCLUSIVE & EQUITABLE GROWTH	49	a. The poor with national poverty line b. The poor and the poverty line of \$ 1.90 per day	%	B, C, D	1	Directly available from publication every year	WORLDBANK, BPS, SDGs Center
	50	Number of floods	Number	B, D	11, 13	Available, need to be filtered and processed from raw data	BNPB
RESILIENCE	51	Population affected by flooding	Number		11	Available, need to be filtering and processed from raw data	BNPB
	52	Access to healthcare	Doctors/ 1,000 people		3	Available from year 2010-2015	Health Profile Department of Health of East Kalimantan
	53	Fish consumption/ production	%	C	2	Available	BPS Prov/stat fish-KKP
	54	Food crop area(s)	Ha	B, D	2	Available, annually	BPS Province / Ministry of Agriculture
	55	Wetland area(s)	Ha	A, B	15	-	RAMSAR Sites Information Services
	56	Cultivated areas of palm oil by smallholder farmers	Ha	A, B	10	Available in 2013	Palm Oil Statistics 2013-2015
	57	Productivity of palm oil smallholder farmers	Tons	A, B	10	Available from 2013-2015	Palm Oil Statistics 2013-2015
	58	Forest fires	Ha		13, 15	Available from 2011-2016	KLHK, BNPB
	59	Peatland fires per year	Ha	B, D	15, 17	Available from 2005-2012 in Ha	Ministry of Forestry, Agency for Agricultural Research and Development and the Indonesian National Carbon Accounting System (INCAS)
	60	Number of landslides	Number of events	B, C, D	11,13	Available, to be filtered and processed from raw data	BNPB
	61	Number of earthquakes	Number of events	B, C, D	11	Available, to be filtered and processed from raw data	BNPB

DIMENSION	NO	INDICATORS	UNIT	THEME	SDGs GOALS	ASSESSMENT STATUS	SOURCE
RESILIENCE	62	Number of illegal fishing incidents	Number of event	C	14	Available for certain years 2010, 2011, 2013 (East Kalimantan)	BPS KALTIM (East Kalimantan Police)
	63	Threatened mangrove area(s)	Ha	C	14	Available in 2007, 2010, 2011 and 2012	East Kalimantan Forestry Council Report and SLHI
	64	Corruption Perception Index (CPI)	Score		16	Available from 2014-2015	BAPPEDA KALTIM

Notes:
 * The theme of each indicator based on GGGI's short list is coded as follows:
 A = Provincial Baseline Indicators C = Maritime
 B = Indicators EK-CK D = Ecotourism



2.3.1 Development of Green Economy Indicators: National, Regional, and Special Economic Zone Development Contexts

National, provincial and sector-specific green economy indicators have not yet been developed for Indonesia. Every country in the world can develop an objective approach and their own version of indicators according to the needs and characteristics of the territory, which differs from one country to another. Indonesian statistics may be regarded as the most comprehensive in Southeast Asia. However, it can be argued that the data context for green growth is still far from satisfactory, especially concerning specific environments and natural resources. Evaluation on green growth will be very useful in the development of other instruments, such as green GDP.

National Planning and Development Agency (BAPPENAS) and GGGI are developing green growth indicators for national and provincial levels. Indicators are developed to be applicable for analysis at micro and macro levels. For example, GGGI has used extended cost benefit analysis

to estimate monetary values of the benefits arising from projects in Special Economic Zones (SEZs). These benefits at the micro (project) level can be attributed to one of the five dimensions of green growth. Progress in these dimensions, in turn, are measured by green growth indicators. The use of these indicators – measurable at the project level – can be of use for policy makers to design incentives for innovative and green policies at the macro level.

GGGI develops a baseline of green growth indicators at the national, provincial, and project levels (e.g. in SEZs). Following the OECD pattern, the green growth dimension of these indicators includes economic growth, greenhouse gas emissions reduction, healthy and productive ecosystems, inclusive and equitable growth, as well as resilience.

Tables 3 and 4 provide a list of baseline indicators recommended by GGGI.

2.4 Assessing Green Growth Opportunities of Plans and Projects

Green growth outcomes are determined by the interaction between economic and policy incentives provided at the macro level and investment behavior on the ground. The bulk of green investments—resource efficient investment with sustainable technologies—is expected to come from the private sector. Therefore, government plans and policies need to consider drivers or inhibitors of private investment. Planners and policy makers need to set standards in project design and execution. Assessing the performance of projects and policies at an early stage provides an opportunity to redesign these investments, thereby improving the quality of their impacts and ensuring these projects contribute to delivering green growth, hence contributing to sustainable development.

2.4.1 Green Growth Assessment Process

The GGAP is a tool designed to select policies (macro level) and prioritize projects (micro/project level) to achieve green growth outcomes. It is an eight-step process through which various tools are used to identify and promote these outcomes in a consistent manner. The prioritization is based on economic, social and environmental data expected to be available at the project inception phase. GGAP emphasizes the robust assessment of the projects and policies performance. It also helps planners, policy makers and investment decision makers to improve both the design of planning processes at the macro level and the quality of project investments coming in.

The eight-step process are as follows: (1) visioning; (2) defining business as usual (BAU) condition; (3) project identification; (4) feasibility assessment; (5) green growth potential assessment; (6) extended cost benefit analysis (eCBA); (7) redesigning enabling condition; and (8) business case development (Figure 1).

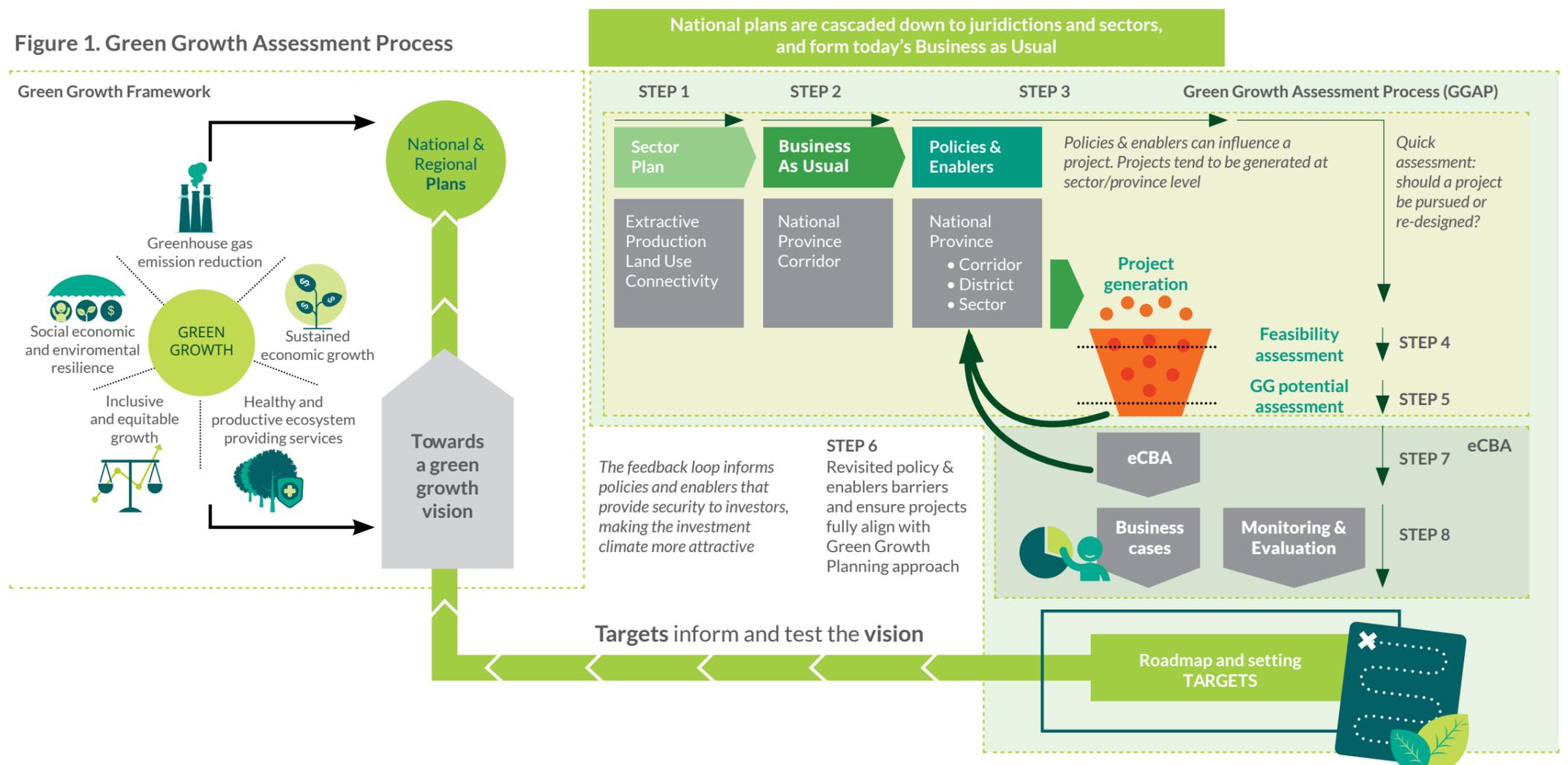
1. Visioning. The process needs to be vision-led and built upon the existing strategies and priorities of Indonesia and key stakeholders, as expressed through key national and regional planning documents. These visions will provide the context for assessing BAU for each sector.
2. Defining BAU scenarios that will be used in the project analysis and provide the background to which project impacts can be compared and allow us to assess the difference where efficient technologies; renewable resources; and environmental and social sustainable practices are implemented.
3. Project Identification. Projects are identified and grouped into innovative and efficient technologies using renewable resources by implementing the best environmental and social management practices that have the potential to achieve the vision in a greener manner.
4. Feasibility Assessment. Projects are filtered using a

set of feasibility criteria to determine any immediately insurmountable barriers to project implementation.

5. Green Growth Potential Assessment. Projects are assessed according to possible greener alternatives for the planned outcomes and, at the same time, supporting the vision.
6. eCBA is undertaken on projects identified in Steps 4 and 5 (more details in Chapter 4).
7. Redesigning Enabling Conditions. The eCBA will reveal whether or not the project in question has higher net benefit compared to previous condition where BAU is implemented. Enabling conditions are redesigned at this stage to support the greener alternatives. Enabling condition can be in the form of policy reform such as improving investment climate; and policy intervention such as tax or subsidy. It is an iterative process of Steps 3 to 5.
8. Business Case Development. Business cases go beyond recommending priority interventions and targeting individual decision makers and processes within the government to encourage their uptake. Periodic evaluation is conducted to ensure the realization of green growth outcomes.



Figure 1. Green Growth Assessment Process





2.4.2 Mainstreaming Green Growth through Green Growth Assessment Tools

Recalling the GGAP, green growth assessment tools to help promote:

- **Consistency between vision and implementation, and between plans and projects:** Although project development is driven by an overarching national development policy, projects tend to be generated at sector and/or provincial levels. Therefore, gaps can appear between overall strategic objectives and project development. It is therefore critically important to assess projects' contribution and performance against green growth indicators in order to identify gaps and eventually re-design individual projects.
- **Optimization of resource allocation through project prioritization:** Green growth assessment tools help to assess the total economic value of specific projects, their performance against specific indicators, or their contribution towards specific green growth outcomes. Assessment across a large pool of potential projects will facilitate comparisons of performance and eventually show how decision-makers can prioritize resource allocation towards projects that deliver the highest green growth performance.
- **Feedback and continuous policy improvement:** eCBA aims to develop business cases for investments, which contribute to green growth outcomes. They provide valuable feedback on policies and enablers that allow the transformation of green interventional alternatives into bankable projects. eCBA creates valuable insight on removing policy bottlenecks and required incentive schemes, which contribute to the continuous improvement of the sector's policies.

Green growth assessment tools also provide **a point of reference** to integrate social, economic, and environmental components into holistic and trans-sectoral planning, particularly at the policy and project design, and planning stages.



2.5 Social Sustainability, Gender Equity and Inclusivity Concept

2.5.1 Overview of SPRSI Framework

Social sustainability is defined to include Safeguards, Poverty Reduction, and Social Inclusion (SPRSI). It is designed to avoid or mitigate risks of adverse impacts while also seeking to maximize social benefits. There are seven common principles of safeguards: (a) No worse off, do no harm, and do good, which are non-negotiable, followed by (b) Avoid, minimize, reduce, mitigate, and compensate, (c) Sustainable approaches for environmental and social benefits, (d) People's participation and consultation, (e) Public disclosure, (f) Integration in the overall project cycle, and (g) Develop and strengthen capacity.

The safeguards are commonly structured along general issues, specific issues, and practices. General issues are usually employed as an umbrella policy, outlining the general commitments and principles, such as human rights, gender equality, poverty reduction, inclusiveness, and partnership. The umbrella policy also defines the safeguard's roles and responsibilities. Specific issues are adopted through a set of issue-specific policies that are usually translated into operational policies, procedures, as well as performance indicators. Some examples are policies on gender mainstreaming, indigenous community, land acquisition and resettlement. In addition, guidance notes, particularly on good practices and lessons learned, are usually made available for easy and quick references.

There is also an emerging trend to combine operational policies and procedures into a framework. Some international organizations refer to it as a sustainability framework. The World Bank's Environmental and Social Framework and IFC's Sustainability Framework are some instances of this framework. Concerns and grievances, which used to be part of the general policies of the institutions, are frequently addressed within the framework.

There are three key steps: (a) project assessment or screening phase, (b) categorization (usually by risks), and (c) risks management. Decision-making process for the safeguards are integrated into the existing decision-making processes for project approval and implementation. The social impacts and risks usually cover the following seven issues of (a) Assessment of environmental and social impacts and risks, (b) Community health and safety, (c) Indigenous peoples/communities, (d) Land acquisition, displacement and resettlement, (e) Cultural heritage, (f) Labor and working conditions, (g) Potential conflicts and conflicts resolutions, and (h) Environmental impacts and risks.

Green Growth Indicators detailed in Section 2.3 include important indicators representing social sustainability. Specifically, these indicators are included in the dimension of Inclusive and Equitable Growth, such as percentage of female employment in agriculture and non-agriculture sector, literacy rate, gender gap in literacy rate, equality, women unemployment rate, percentage of households with access to sanitation, number of natural resource conflicts and percentage of the poor below poverty lines.

2.5.2 Gender Equity and Inclusivity Concept

The promotion of women does not mean applying the same assumptions or equivalent measures as men. In traditional societies, it is usually men's needs, circumstances, and characteristics that are the norm and then applied to women, assuming the needs are the same. The objective of gender mainstreaming is to consider the differences between men's and women's life patterns and to use them as consideration in all actions.

Gender is the social, behavioral and cultural attributes, expectations and norms associated with being male or female. Gender equality promotes equal opportunities, rights and responsibilities for men and women, boys and girls. It is also a central precept of social inclusion that respects the marginalized, discriminated, and vulnerable people within a population. Poor, indigenous, rural/isolated, illiterate, disabled, migrant women are twice, sometimes three times, more disadvantaged.

36 Women's full and equal participation in decision-making and leadership in the public and private sphere is an important right in itself. Diversity delivers strong outcomes for the household, community, public, and private sector. Women's global lack of decision-making within the household, community, politics and business sector limits their influence on, access to, and control of, resources and input into the policy-making process.

Women's access to decision-making; resources; land and services can effectively increase sustainable development and growth, not only for themselves but also for the next generation who benefits from the economic gains of women. They also have greater household vested interests in cleaner fuel, water, waste disposal, and sanitation for the whole family. Their increased decision-making in these areas leads to their progression from passive spectators in community development to active participants and potential leaders.

Inclusive and effective growth can only happen if the needs, potential, and participation of the full population are met, and women have the same rights, responsibilities, and opportunities as men. Many studies have illustrated that increasing women's active participation and ownership within community development leads to increased efficiency and effectiveness of programming.



Global commitments on gender equality are as follows:

- Convention on the Elimination of All Forms of Discrimination Against Women (Statement on Climate Change and Gender Equality adopted at the 44th session of CEDAW New York in 2009)
- Platform for action at the United Nations Fourth World Conference on Women in Beijing in 1995
- Sustainable Development Goals (SDGs on gender equality and the empowerment of women and girls, as well as integrated targets across the SDGs)
- UN Framework Convention for Climate Change (23/CP.18 on gender equality in representation and many on substantive issues)
- Sendai Framework for Disaster Reduction 2015-2030 (priority 4)

All these commitments look at women as the central core in sustainable development and green growth, and the realization of women's full and equal human rights as necessary for sustainable development. Collecting disaggregated data on gender and consulting with local women and women's groups are articulated as key strategies to increase women's participation in decision-making and economic activities, as well as to reduce gender inequalities. The Gender Equality Strategies includes:

- Addressing specific needs and concerns of women through gender responsive green growth strategies;
- Addressing the social inclusion of the most vulnerable boys, girls, men, and women;
- Contributing to environmental sustainability that considers the needs, roles, and voices of women in their productive, reproductive, and community;
- Supporting economic growth that addresses the issues and needs of women's roles in unpaid and paid work in informal, formal, and private sectors; and
- Increasing women's voice in decision-making and the economy as contributions to sustainable green growth.

Gender mainstreaming needs to be considered in key thematic areas of energy, land use, green city development, and water. Improvement in energy services is aimed at supporting the three main components of the economy:

productive activities, domestic activities, and public services. When improved energy services, such as electricity, are introduced, women's lives and gender relations are transformed, when for example, men begin to help with household chores. Women's activities tend to be the last to be mechanized or electrified. Improved energy quality and availability is central to increasing the productivity of labor, in higher levels of employment and wages over time, which then result in improved standards of living. Possible entry points for mainstreaming gender in energy include:

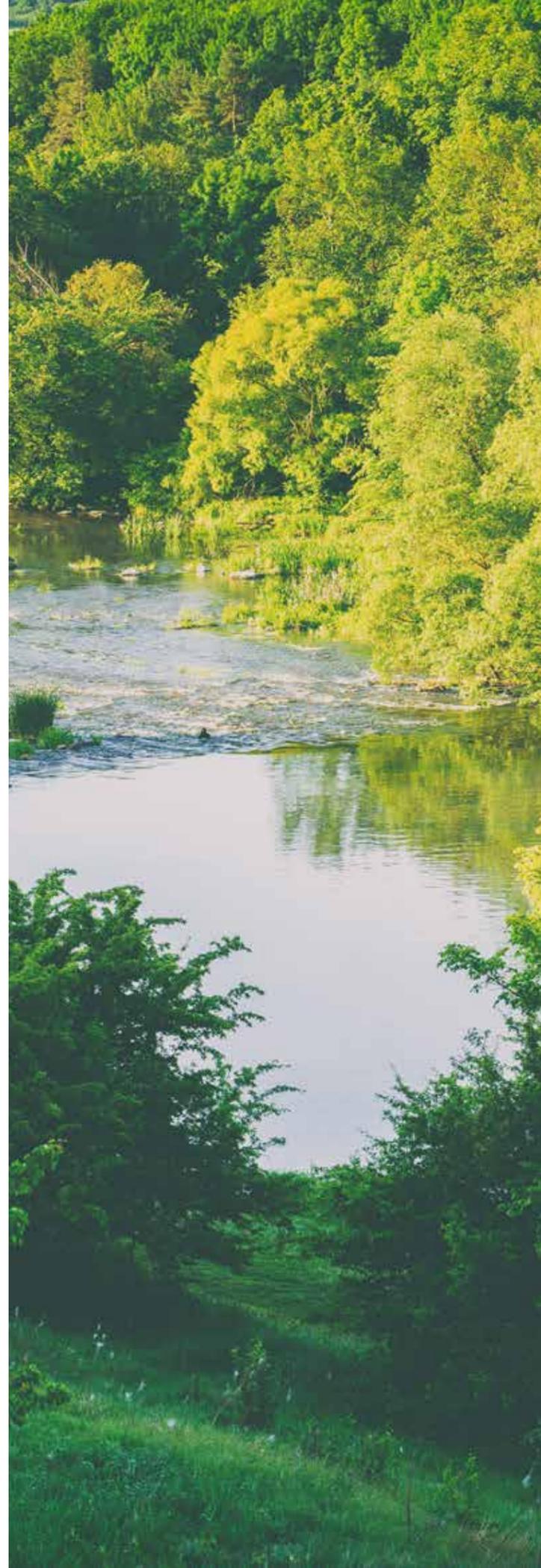
- Addressing the household needs of women in obtaining and maintaining access to safe, affordable, and sustainable forms of energy
- Ensuring women's active roles in participatory decision-making around community energy decisions

Green city development needs to consider the evidence that women and men use urban services, access urban environments, and are affected by cities differently.

There are some components of urban planning which can be gender responsive, including mixed use, accessibility, mobility, safety and security, as well as distribution of services. The link between urban planning, poverty reduction, economic empowerment of women, and ending violence against women should be captured by the drivers of gender equality and empowerment of women at local, regional, national, and international levels. Possible entry points for mainstreaming gender in green city development include:

- Improving policies, plans, and designs for more socially inclusive cities that foster sustainable development to meet the needs and daily usage patterns of boys, girls, men, and women
- Consulting women's groups in city planning to identify key issues of transport patterns, safety, and zoning for recreational areas for children

Women and men's specific roles, rights and responsibilities, as well as their particular pattern of use and knowledge of agriculture, forestry and other land uses (AFOLU), shape their experiences differently. As such, gender-differentiated needs, uses, and knowledge of AFOLU are critical inputs to policy and programmatic interventions that will enable long-term success. To ensure that national AFOLU systems



and programs are inclusive and resilient, specific attention must be paid to the specific roles, requirements and contributions of women and men at every stage of policy and program development, from design to implementation and evaluation. Possible entry points for mainstreaming gender in land-use include:

- Ensuring land use management considers the needs and concerns of the most vulnerable women and men, including active participation of local women focusing on raising the voice of indigenous women farmers and forest dwellers
- Ensuring women's equal access to, and promote women's equal ownership of land

There is a strong link between women's participation and the successful degree of projects on water supply and sanitation (WSS) management sustainability. Among major lessons learned is that women are the primary collectors, transporters, users, and managers of domestic water. They are promoters of home- and community-based sanitation activities. However, their views are not systematically represented in the decision-making process. Possible entry points for mainstreaming gender in water includes ensuring:

- Women's safe and reliable access to water or household use
- Women have access to training, decision making and maintenance of WSS
- Agricultural water supply meets the needs of local women through direct consultation with local women's groups

2.5.3 Application in Extended Cost Benefit Analysis (eCBA)

Extended cost benefit analysis monetizes all costs and benefits of a new program or project which might have wider social and environmental impacts on society or specific groups.

Acknowledgement of a specific group is undertaken in Section 4.3.2. . In the identification of potential impact, all impacts are listed so that in an eCBA, an impact pathway analysis lists all potential positive and negative effects on stakeholders before the quantitative analysis is undertaken.

Chapter 3

Methods for Environmental Decision Making



3.1 Decision Making Process²

The way producers and consumers use environmental resources depends on the property rights governing those resources. Property right refers to a bundle of entitlements defining the owner's rights, privileges and limitation for use of the resource. These property rights can be assigned to either individuals or the state. An efficient structure of property right has three main characteristics:

- **Exclusivity:** All benefits and costs should go to the owner, and only to the owner, either directly or indirectly by sale to others
- **Transferability:** All property rights should be transferable from one owner to another in a voluntary exchange

- **Enforceability:** Property rights should be secure from involuntary seizure or violation by others

When well-defined property rights are exchanged, as in a market economy, this exchange facilitates efficiency. When the seller has the right to prevent the consumer from consuming the product in the absence of payment, the consumer must pay to receive the product. Given a market price, the consumer decides how much to purchase by choosing the amount that maximizes his/her individual consumer surplus. The price system induces those self-interested parties to make choices that are efficient from the point of view of society as a whole.

Exclusivity is one of the important characteristics of an efficient property rights structure. However, exclusivity is frequently violated. Externalities exist when a resource is non-exclusive or exhibits public goods features. Goods and resources are non-

exclusive because they are consumed jointly by many users: their use is non-rival. The classical case is a plant discharging wastewater into a river, thus harming downstream users of the water. The plant owners cause external costs, as others – usually the government – must pay for the clean-up of the polluted river.

Externality arises because the social cost of the extraction or consumption of a resource differs from the private cost. The market price, determined solely by private costs and benefits, will not reflect the true social opportunity cost of the resource or activity. In the case of pollution caused by a private firm, we face a negative externality, as the social cost is larger than the private cost. A positive externality arises when the social benefits arising from the action of a private actor is larger than the private benefits. The commonly cited example is a property

owner who invests heavily in the beautification of her property, such as the garden, and thus increasing the property value of neighboring houses.

Externality is an outcome of an activity between two individuals that affects the activity of a third, without any compensation to or payment by the third individual (positive/negative). In an economy where externality occurs, market prices fail to reflect WTP as external effect on others are not included. Externalities occur widely in Indonesia. Air-, water-, and land-based pollution are already causing losses in Indonesia's economic and broader social objectives, such as health and equity. Externalities often lead to lost or damaged ecosystem services. This reduces the capacity of the environment to provide the services important to human activity and the economy.

Figure 2. Public Goods, Non-Rivalry, Non-Excludable



²Tietenberg, Tom; Lewis et al., 2012



The natural environment and ecosystems are public goods that every member of society can access. These are non-rivalry or 'non-excludable' goods, meaning that if an individual consumes that good, it does neither reduce the availability of the good nor exclude other individuals

Collective action works well to increase or safeguard the quality of public goods, such as public health, resilience, education, and public services³. Vilfredo Pareto proposed a criterion for optimal allocation of resources called Pareto Optimality: allocations are said to be Pareto optimal if no other feasible allocation could benefit at least one person without any deleterious effects on some other person (Figure 3). Allocations that do not satisfy this definition are suboptimal. Suboptimal allocation can always be rearranged so that some people can gain net benefits without

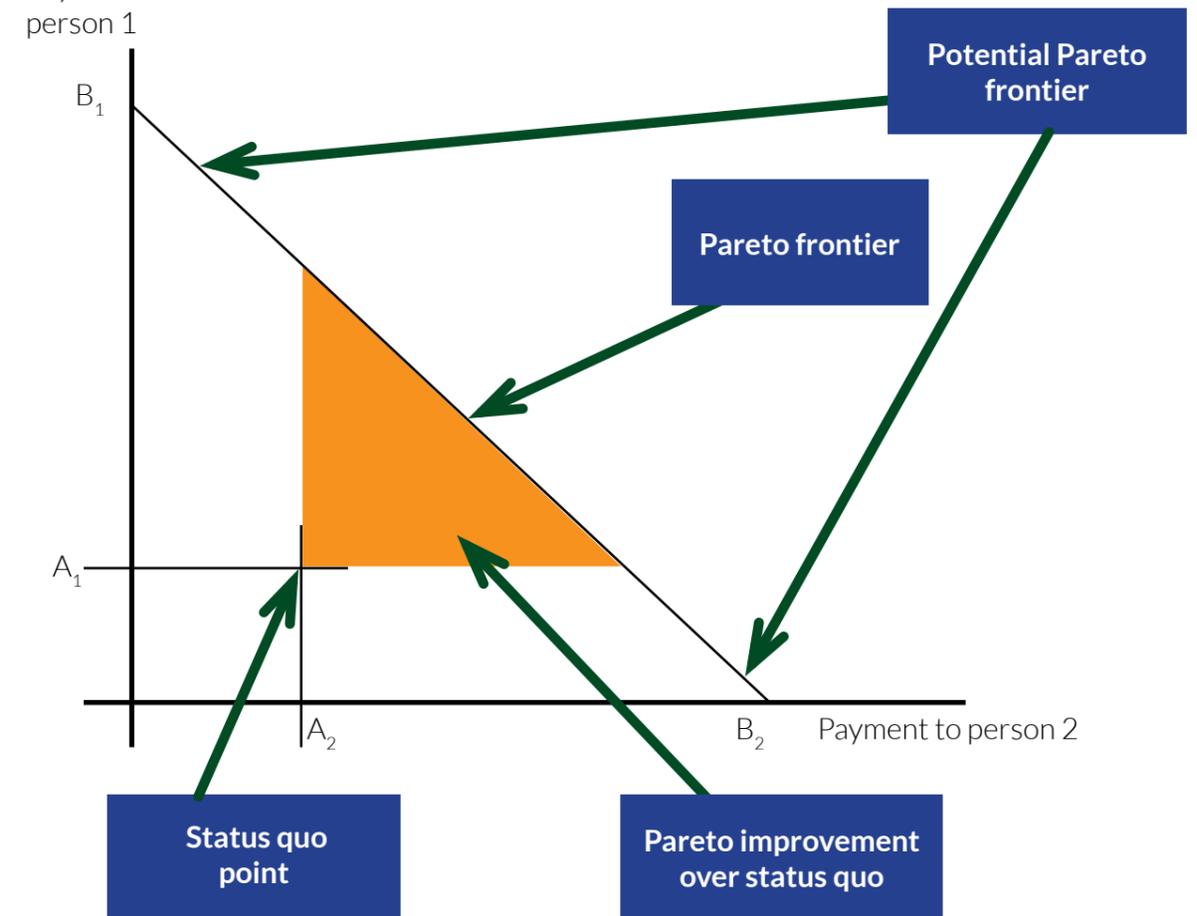
the rearrangement, causing anyone else to lose net benefits. The gainers could use a portion of their gains to compensate the losers sufficiently and ensure they are as well off as they were prior to reallocation.

Meanwhile, efficient allocations are Pareto optimal. Since net benefits are maximized by an efficient allocation, it is not possible to increase the net benefit by rearranging the allocation. Without an increase in net benefit, it is impossible for the gainers to compensate the losers sufficiently, as the gains of the gainers would most likely be smaller than the losses of the losers. To achieve Pareto improvement, important questions need to be answered: (a) What is the criteria used to assess welfare? and (b) Who makes the decision?

Figure 3. Pareto Efficiency

Pareto - Tietenberg

Payment to person 1



³Olson, 1971

The decision-making process needs a foundation for the decision to be efficient. Each individual or group of decision makers needs perfect information and sufficient incentives for them to reach an efficient decision. Minimum information needed are: costs and benefits of the policy, as well as incentives generated by the policy.

The objectives of learning the decision-making process are: (1) to understand how to use the proper criteria and (2) to understand factors that motivate the decision-making process. Supported by comprehensive information, individuals know what is best for themselves. However, it is impossible to survey all societies and collect all information on decision-making. Therefore, we usually employ methods to enable us to obtain aggregate, generalized perspectives by taking samples to represent the population. By utilizing econometrics – building models – we are then able to understand who are better-off and who are worse-off. In the decision-making process, we would also:

- Include environmental assets, social, culture, cultural heritage, as well as inter- and intra-generational fairness
- Consider objectives of various policies which may be conflicting
- Consider value possessed by society for policy alternatives

3.2 Available Methods⁴

Table 1. Methods for Environmental Decision-Making

No	Method	Criteria
1	Cost-benefit analysis	Highest net benefit
2	Cost-effectiveness analysis	Lowest cost
3	Multi-attribute analysis	Highest positive value
4	Safe minimum standard	Highest safety level

Cost-benefit analysis (CBA) is a method that quantifies the social impacts of policies in monetary terms. Generally, CBA can be applied to evaluate policies, programs, projects, regulations, demonstrations, and other government interventions. The aggregate value of a policy is measured by its net social benefits, sometimes simply referred to as the net benefits. The net social benefits, NSB, equal the social benefits, B, minus the social costs, C.

Cost-effectiveness analysis (CEA) is a widely used alternative to CBA, especially in areas such as health and defense policy. Analysts seeking efficient policies but facing constraints that prevent them from doing CBA may find it useful. In particular,

⁴Boardman et al., 2010
⁵Department for Communities and Local Government, 2009

CEA circumvents three common constraints. First, analysts may be unwilling or unable to monetize the most important policy impact. Relatedly, clients may not want monetization. This constraint arises frequently in the evaluation of alternative health policies; for example, many people are willing to predict the number of lives saved by alternative public health programs but are reluctant to place a dollar value on a life saved. Second, analysts may recognize that a particular effectiveness measure does not capture all of the social benefits of each alternative, and some of these other social benefits are difficult to monetize. In using CBA, analysts face the burden of monetizing all impacts. If the effectiveness measure captures most of the benefits, then it may be reasonable to use CEA to avoid the burden of conducting a CBA. Third, analysts may be dealing with intermediate goods of which linkage to preferences is not clear. For example, the exact contribution of different types of weapon systems to overall national defense is often unclear. In such situations, CBA is not possible, but CEA may give useful information concerning the relative efficiency of alternatives.

CEA compares (mutually exclusive) alternatives in terms of the ratio of their costs and a single quantified, but not monetized, effectiveness measure. For example, alternative highway safety programs may each involve different costs and numbers of lives saved. The cost-effectiveness ratios of the programs would be expressed as dollars per life saved, and the program that costs the least per life saved would be assessed as the most efficient. In many circumstances, an assessment is valid. In other circumstances, however, the assessment would not be valid because cost-effectiveness ratios ignore scale effects, ranking policies that produce small impacts at a relatively low cost per unit above policies that produce much larger impacts at a somewhat higher cost per unit. Consequently, interpreting cost-effectiveness ratios as measures of efficiency should be conducted carefully.

In some applications, especially in health policy, it may be possible to construct an outcome measure that serves as a direct proxy for changes in individuals' utilities. In such applications, CEA is referred to as cost-utility analysis (CUA). For example, the benefit measure may be quality-adjusted life-years, which combines both the number of additional years of life and the quality of life during those years. If a CUA employs a perfect proxy for changes in utility, then use of the marginal utility of money would enable the analyst to move directly to CBA; this would not be the case for a CEA that excludes some dimension of utility, such as quality of life.

Multi-attribute analysis (MCA)⁵ is a technique that does not rely on monetary valuations. A key feature of MCA is its emphasis in establishing objectives and criteria, estimating relative important weights and contributions of each option to each performance criterion. One limitation of MCA is it cannot show that an action adds more to welfare than it detracts. Unlike CBA, there is no explicit rationale for a Pareto Improvement rule

that benefits should exceed costs. In MCA, as is also the case with CEA, the best option can be inconsistent with improving welfare, so doing nothing could in principle be preferable. However, MCA has many advantages over informal judgment unsupported by analysis: (a) it is open and explicit; (b) the choice of objectives and criteria are open to analysis and to change; and (c) scores and weight are explicit and are developed according to established techniques.

The Safe Minimum Standard (SMS)⁶ approach is a collective choice process that recommends protecting a minimum level of a renewable natural resource unless the social costs of doing so are very high (excessive, intolerable or unacceptably high). The SMS approach can be simply cast as a strategy for avoiding regret in situations where physical parameters are poorly understood and there is a potential irreversible loss. In such situations, a rational decision criterion may be to consider the costs of being wrong, and under such a minimax regret decision rule, the SMS is consistent in both the lottery and insurance games. For efficiency reasons, environmental economists

generally prefer incentive-based approaches over quantity-based approaches to environmental regulation: pollution taxes to pollution quantity standards. However, there is a case where physical quantity controls may be preferred to prices, usually when there was relatively greater uncertainty about the benefits of an environmental protection action relative to the cost of a protection action.

Where irreversibility is involved, such as species losses where intergenerational issues taking place, current generation constricting future generation choice, then, CBA decision rule is lacking. An efficiency-oriented approach used in CBA would overlook this issue. In contrast to the standard CBA decision rule, SMS does not use a fully welfare approach, as it does not require complete estimation or articulation of the monetary benefits of preservation. SEA and EIA use some of the SMS approach in their assessment process.

All methods have a different purpose for the assessment process of development plans and spatial plans (Figure 4).

Figure 4. Methods Used in the Decision-Making Process



⁶Berrens, 2001

3.3 Overview of the Impact Assessment Process in Indonesia

EIA and SEA are widely accepted impact assessment tools that provide valuable inputs for the development planning process and investment decision-making. They help mitigate and identify potentially negative environmental and social impacts, though their objectives tend to differ. SEA primarily focuses on the higher-level policy decision process and as stated above, it is one of the methods in the multi-attribute analysis group. In contrast, EIA is used as a decision-making tool at the project level. EIA belongs to the group of safe minimum standard methods where every project with high and/or important negative impacts should be assessed and altered so that it complies with environmental standards.

Both impact assessment processes have evolved throughout time and across countries, and they cover varying scopes in terms of the considered impact and the level/complexity of analysis. Both SEA and EIA assess impact of plans/projects on the environment. Both processes define the environment as natural, social, and man-made environments, including the economic system. Both are legally enacted in Government Regulation No. 46 of 2016 and Government Regulation No. 27 of 2012 for SEA and EIA, respectively. Both government regulations are mandated by the Environmental Protection and Management Act (Law 32/2009). Table 2 below provides a review of SEA and EIA in Indonesia, including their legal basis and scope. Both assessment methods can employ eCBA in their assessment process. Means to employ eCBA are depicted in Figure 6 and Figure 7.

Table 2. Review of Environmental and Social Impact Assessment Tools in Indonesia

TOOL	SCOPE	LEGAL BASIS
Strategic Environmental Assessment (SEA)	<ul style="list-style-type: none"> Policy, regulations, programs, and plans Environmental, social, economic, public health impacts 	<ul style="list-style-type: none"> Law No. 32 of 2009 on Environmental Protection and Management Government Regulation No. 46 of 2016 on SEA Ministry of Environment Regulation No. 9 of 2011 on General Guidelines for SEA implementation Ministry of Environment Regulation No. 27 of 2012 on Environmental Licenses Ministry of Home Affairs Regulation No. 67 of 2012 on Guidelines for the Implementation of SEA in the Development or Evaluation of Regional Development Plans
Environmental Impact Assessment (EIA)	<ul style="list-style-type: none"> Physical projects Environmental, social, economic, public health impacts 	<ul style="list-style-type: none"> Law No. 32 of 2009 on Environmental Protection and Management Government Regulation No. 27 of 2012 on Environmental Licenses Government Regulation No 12 of 2012 on EIA Ministry of Environment Regulation No. 16 of 2012 on Guidelines for Environmental Document Development Ministry of Environment Regulation No. 8 of 2013 on Appraisal and Examination of Environmental Documents and Environmental License Granting Ministry of Environment Regulation No. 17 of 2012 on Guidance of Community Involvement in Environmental Impact Analysis and Environmental Licensing Process Ministry of Environment Regulation No. 5 of 2012 on Types of Businesses and/or Activities That Require Environmental Impact Analysis

Figure 5. Overview of the SEA Methodological Process in Regional Planning Assessment

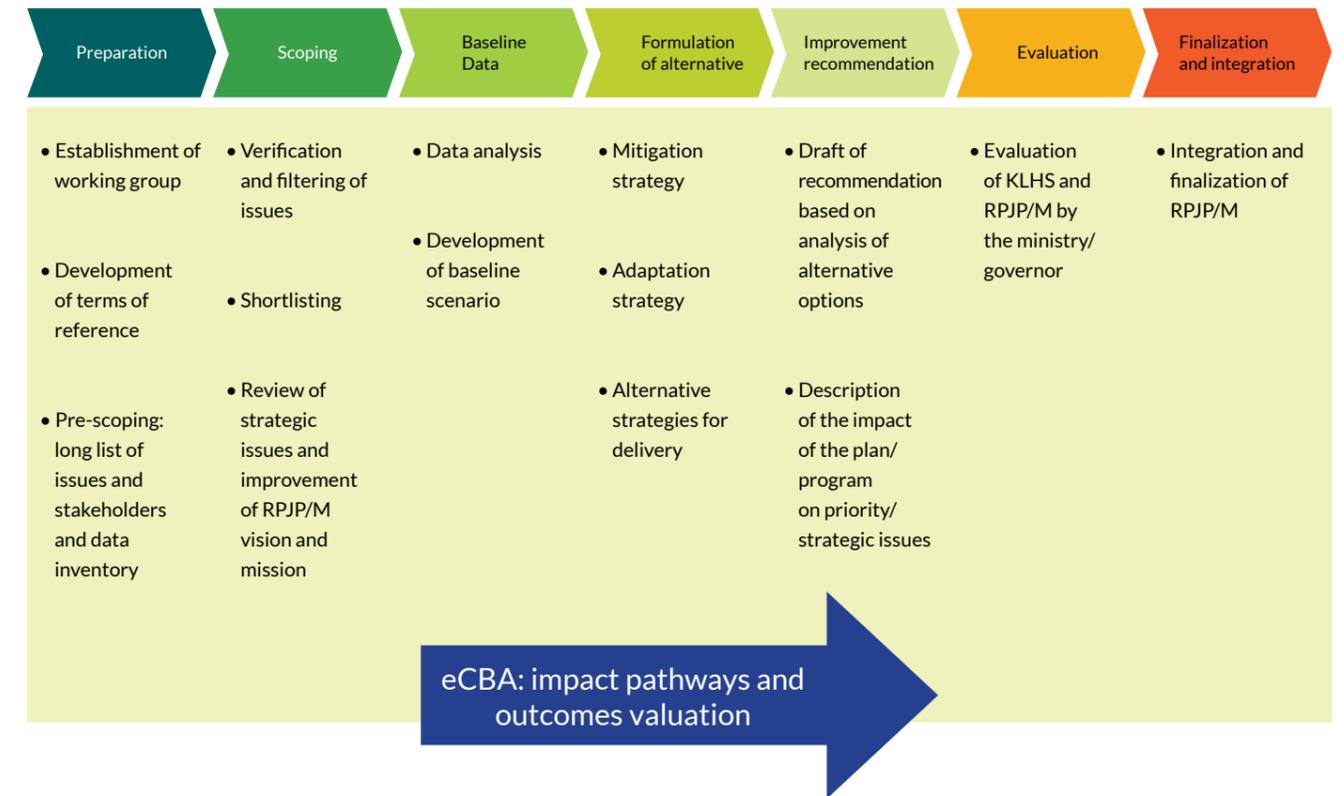


Figure 6. Application of SEA in formulation of National Development Plan

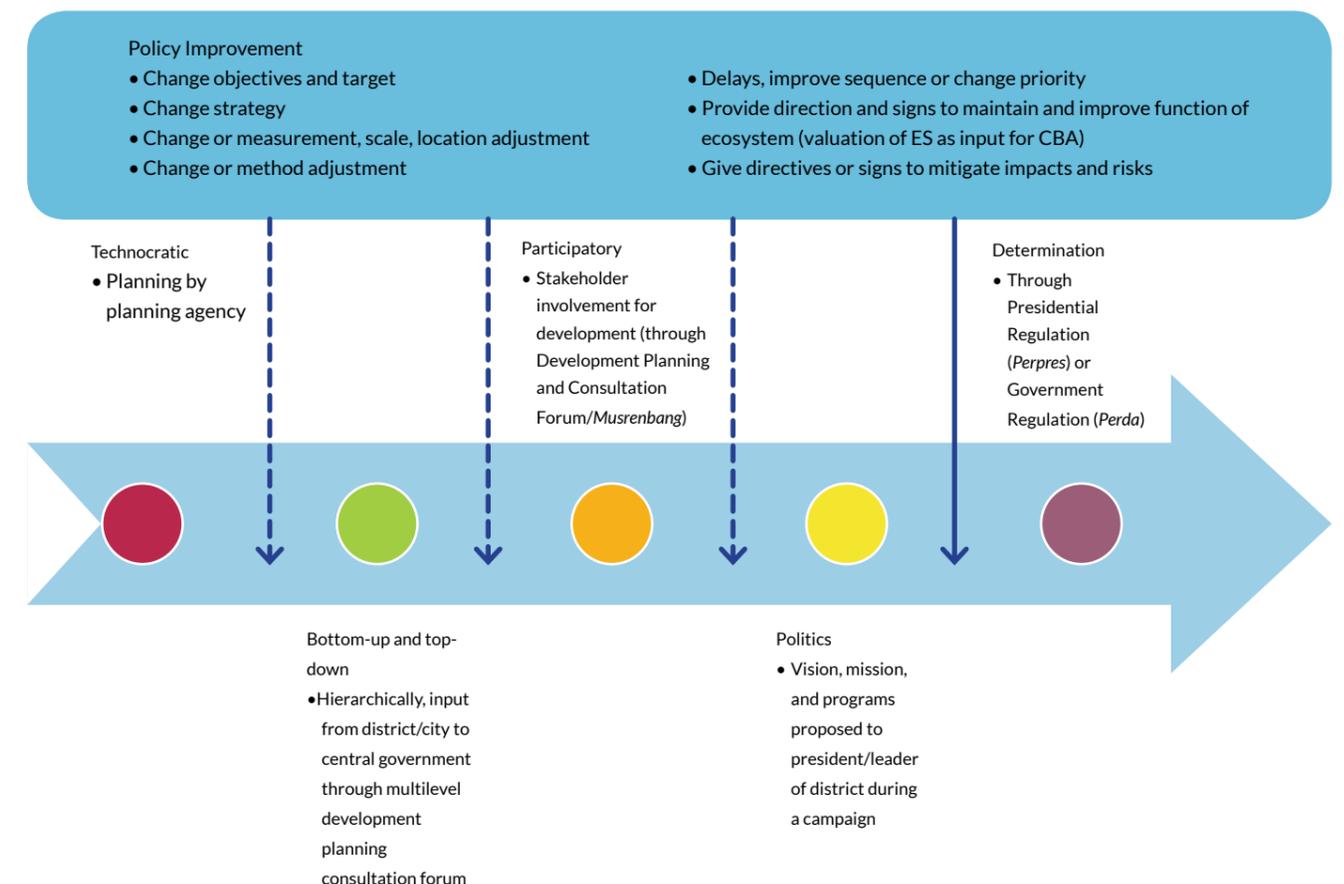
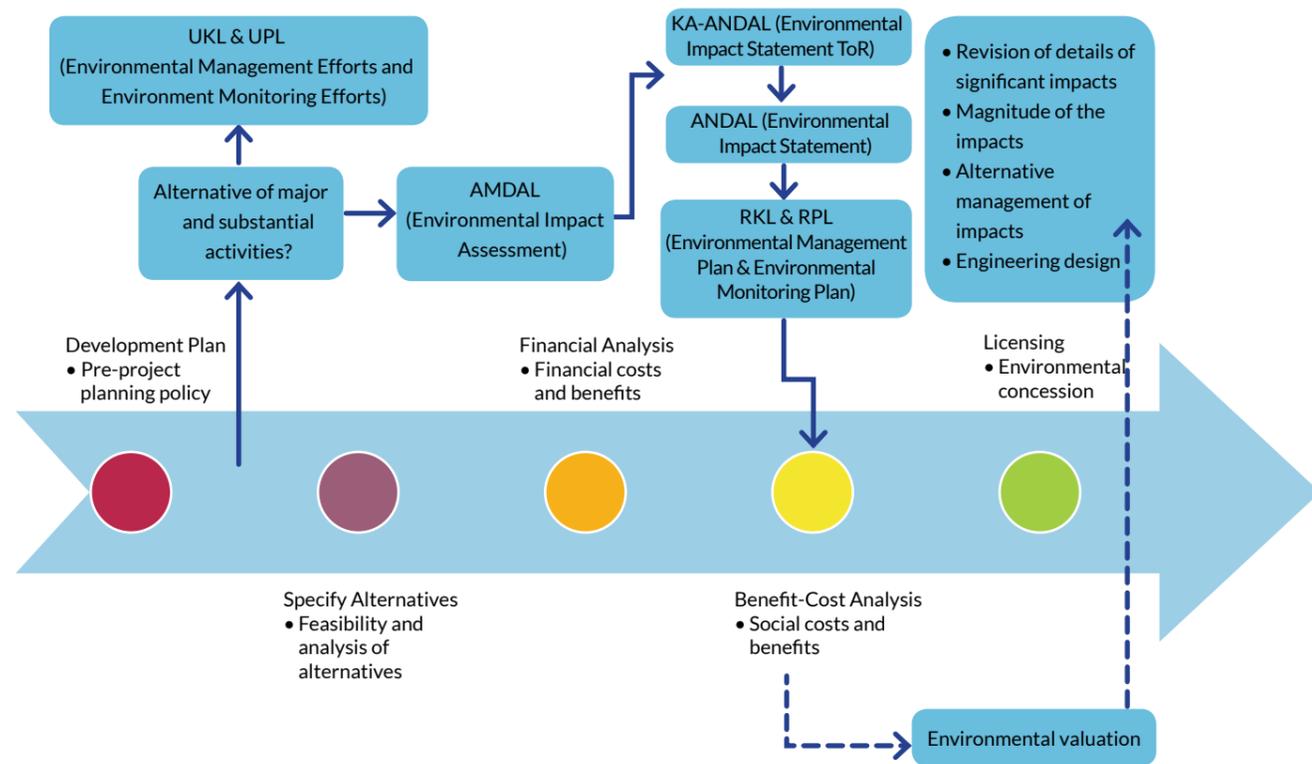


Figure 7. Application of EIA in Project Appraisal



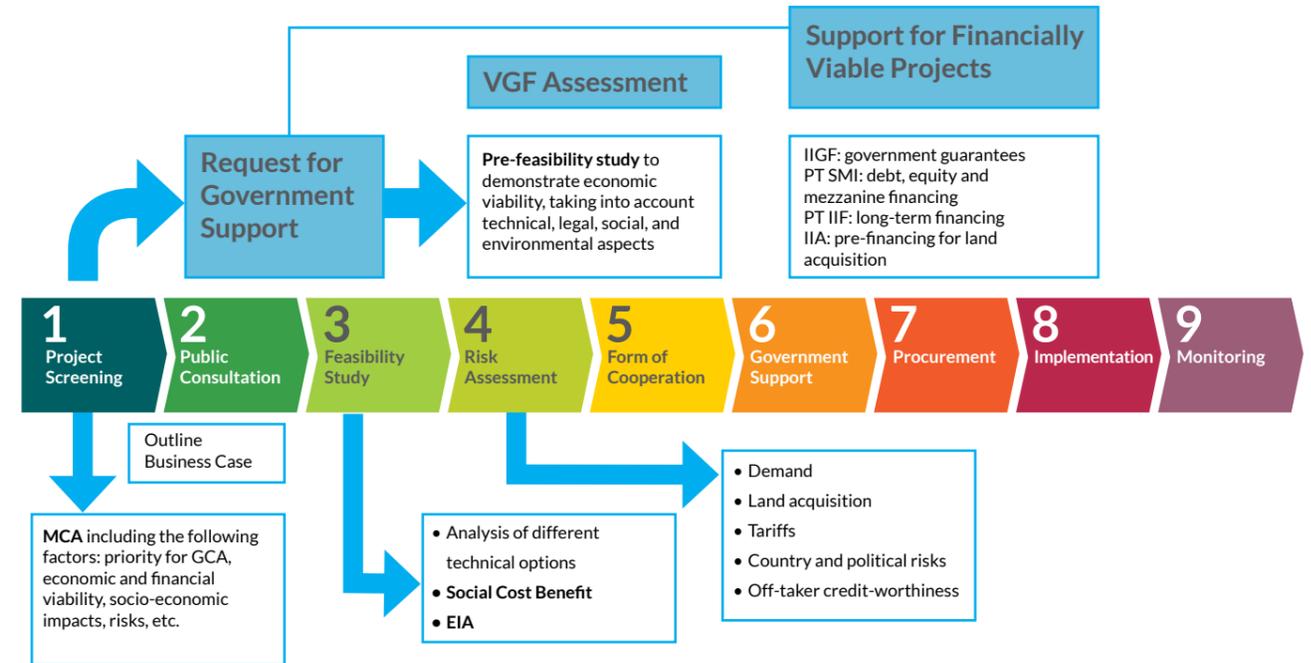
3.4 Practical Steps for Integrating eCBAs

Further analysis of the SEA methodological guidelines highlights several opportunities to improve synergy with an eCBA methodology. The SEA process follows the same logical framework as the eCBA. It starts with scoping the issues, developing a baseline scenario and then one or several alternative scenarios as needed, and finally proposing recommendations for improved green growth performance (Figure 5). The eCBA methodology provides more robust inputs for decision-making by introducing economic valuations in its recommendations, facilitating a more informed and rigorous decision-making process. Through the utilization of the eCBA methodology, the green growth contribution in all alternative scenarios can be converted into monetary value in SEA. Hence, it is easier to be communicated in fora with society, local government as well as legislative (Figure 6). Communication with stakeholders is key to gain approval and cooperation in implementing the plan.

EIA, in the 1st stage of AMDAL follows the same procedure as eCBA. AMDAL aims to define a clear baseline scenario, identify and quantify impacts, develop and assess alternative scenarios, as well as ultimately provide recommendations for improving the green growth performance of the project. The difference is that AMDAL does not monetize the impacts. eCBA can assist AMDAL by providing a single unit to the overall impacts assessed, such as monetary. AMDAL provides ways to follow up the assessment process by formulating Environmental Management and Monitoring Plans. Combining both methods provides a more robust assessment (Figure 7).

⁷Worldbank definition: <http://ppp.worldbank.org/public-private-partnership/overview/what-are-public-private-partnerships>

Figure 8. Overview of the PPP Project Development Process & Impact Assessment Process⁸



Feasibility studies are required in the PPP framework to create an analysis of potential environmental and social impacts. This analysis leads to an assessment of potential alternative delivery solutions based on Environmental Impact Assessment and Social Cost Benefit Analysis⁹. Social Cost Benefit Analysis is particularly important in the context of PPPs, as they allow an improved assessment of the total economic value of infrastructure projects in order to justify government support through incentives, guarantees, or financing.

Although the guidelines and methodologies for EIAs are well-developed and regulated in Indonesia, similar guidelines have not been developed for Social Cost Benefit Analysis in the PPP framework. The existing PPP regulatory framework also does not provide detailed guidelines for Social Cost Benefit Analysis. In practice, the majority of current priority PPP projects in development have been partially sponsored by institutional donor agencies. Social Cost Benefit Analyses have been referring to existing guidelines in force within those organizations. The World Bank and JICA, for example, have

their own SCBA guidelines that have been used in projects they support. However, diverse methodologies make comparative assessment and prioritization challenging. Considering that the KKPPI, P3CU, and MoF are mandated to assess prospective PPP projects based on such analyses, the standardization of Feasibility Studies and SCBA would contribute to improve and facilitate project assessment and prioritization. The eCBA methodology presented in this handbook will provide a strong foundation for such standardization.

Successful integration of GGAP and eCBA into policy and project planning as well as environmental and social impact assessment processes will help decision-makers to obtain comparable results across different options and scenarios. For each aforementioned process – developing alternative scenarios in the SEA process, supporting the improved rigor of the EIA process, and complementing the PPP planning process – the eCBAs help to define and provide the same value in unified monetary terms.

⁸Source: *Public Private Partnership: Investor's Guide*, Coordinating Ministry of Economic Affairs

⁹Social Cost Benefit Analysis and eCBA impact assessment methodologies are very similar in nature and can be used interchangeably for the purpose of our policy discussion.

Chapter 4

Extended Cost Benefit Analysis

4.1 Making Hidden External Costs and Benefits Visible

An extended Cost Benefit Analysis is an economic appraisal tool that takes a broader view of benefits and costs accruing to all stakeholders, including social, economic or environmental aspects. This is essential in a world where **externalities, public goods, and other market failures** are often not taken into account. Using eCBA helps both public and private sectors to be more informed when making decisions. Not only that decision makers will see the real costs of projects more clearly, but also the benefits of avoiding these costs.

With reference to Chapter 3, an economy that does not value natural capital properly usually ends up with negative ecological and socio-economic impacts. Typically, these negative impacts reverberate along a causation chain or an impact pathway. Deforestation and poor land management are some frequently cited examples. Normally, when investment decisions are made, only capital expenditures, O&M and revenues are accounted. However, land use changes have also bio-physical effects and impact the quality of ecosystem services. These impacts, in turn, affect the values of the services that various stakeholders use. These values are frequently neglected in investment plans and project appraisals.

Overharvesting of timber is linked to unsustainable palm oil and mining practices, coupled with poor regulatory oversight, such as insecure land tenure and overlapping of concessions. This sets off a chain of negative impacts and changes important ecological functions, resulting in further bio-physical changes. In the end, social and economic impacts arise, as humans have to face a loss of resources and services that nature provides. Damaged ecosystems can be in the form of unproductive soils, loss of protection from flooding, reduced water supply, reduction in species diversity, and any other impacts that undermine food and water security. Addressing these externalities clearly provides a rationale for public policy intervention. Sustainable land use policies do anticipate and address these externalities at the very beginning of the investment and project implementation cycle. This will result in benefits that consist not only of revenues from sustainable production and resource extraction, but also of avoided costs.

Currently, many projects—implemented by state-owned or private companies—do not have strong regulatory incentives and sanctions to rigorously think about integrating environmental costs into project planning. As a result, unaccounted external costs in the production of goods show up later as clean-up costs accrued to society. If these costs are known and quantifiable, then governments have an evidence-based platform to be used as the basis of designing policies and regulations to impose costs on polluters. In other words, these hidden costs need to be internalized and monetized.



4.2 Scope of eCBA

The eCBA can be used for a specific investment proposal as well as for broader analyses. The term “project-level eCBA” is used when applying eCBA to individual projects and investments. A project-level eCBA is flexible in scope and can encompass different geographies and timeframes depending on project size. Different users can also apply the project-level eCBA across different sectors. While the key purpose of the eCBA is to enable the design or re-design of individual projects to better achieve the desired outcomes, the tool can also be used to draw policy implications across the five desired outcomes of Indonesia’s green growth. In particular, eCBA can be used in four broad ways to drive green growth policy and planning:

1. As **justification** for change in public policy
2. As a tool for **quantification** of existing or proposed policy incentives
3. As a tool for **prioritization** of green growth policies
4. As a **validating mechanism** before policies are enacted and implemented

Specifically, it can be used by governments and businesses:

1. To allocate resources for the projects or policies with the highest green growth performance
2. To re-design and optimize publicly-funded projects
3. To inform policy on barriers and enablers of green growth
4. To build a business case for projects with green growth benefits in order to attract private investment

The Government of Indonesia has undertaken five eCBA studies on an experimental basis (see Figure 9). The scope of analysis varies across these studies. Three eCBAs were applied in economic zones, with selected individual project interventions analyzed for their potential green growth outcomes. A fourth eCBA reviewed one particular project operating under an Ecosystem Restoration License. The fifth eCBA calculated the net benefits of four renewable energy projects in Central and East Kalimantan. It then used these estimates to extrapolate the total benefits associated with renewables across all of Kalimantan. These examples demonstrate the versatility of project-level eCBAs in terms of scope and their power as tools for examining greener alternatives to baseline, BAU scenarios.

Figure 9. Overview of eCBA Studies Undertaken by GGGI in Indonesia

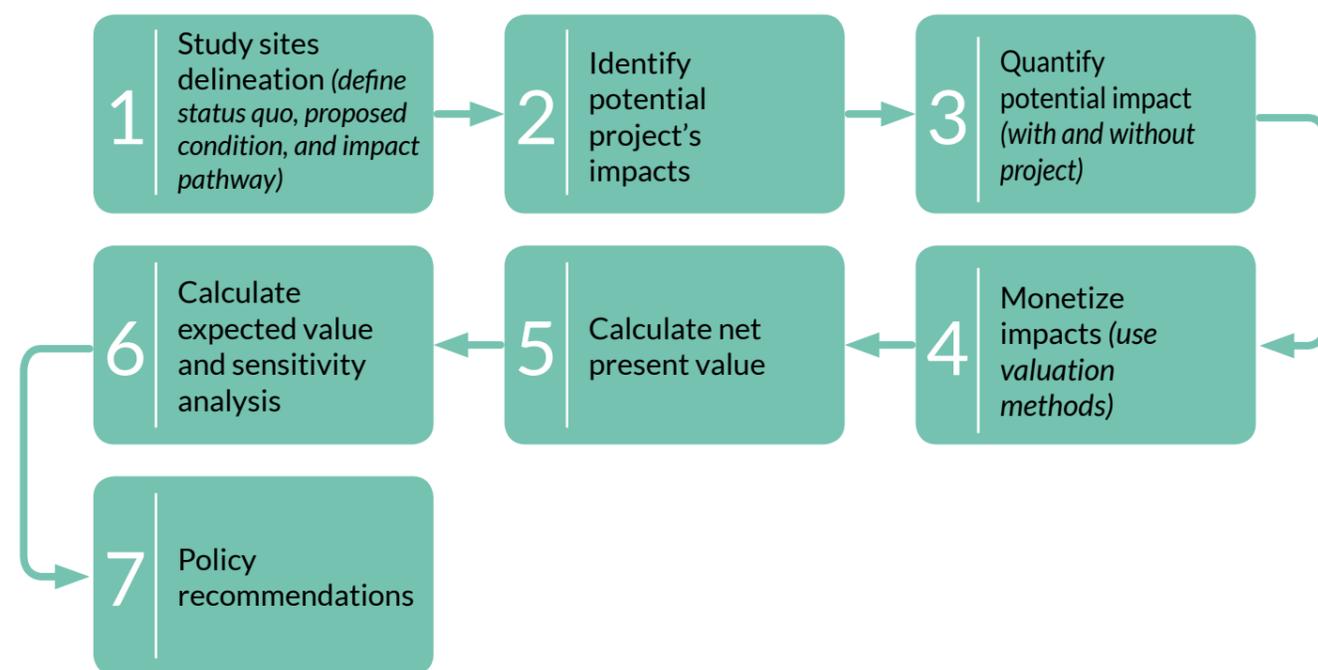
SCOPE/SECTORS	BENEFITS (NPV)	POLICY BARRIERS AND ENABLERS	
		REGULATORY ISSUES	FISCAL AND FINANCIAL INCENTIVES
KEK Maloy	USD 3.8 billion or 10% regional GDP	Reform of energy pricing system and feed in tariff	Support adequate feed in tariff for renewable energy (biomass)
Natural resource processing industries		Clarification of palm oil certification process and legal status	Tax exemptions for renewable energy capital equipment
Infrastructure: energy, road, transport, port			
KSN Mamminasata	USD 355 million or 6% regional GDP	Clearer regulation on waste management	Ecosystem services levies
Fishery		Matching spatial and land use plans	Subsidy for waste reduction
Reforestation/clean water			Tax relief for investment in waste to energy equipment
Waste management			Financial support for local fish feed industries
Renewable energy			
ERC Project Katingan		USD 9.9 billion	Streamlining and improving transparency of ERC licensing
Ecosystem restoration and conservation	Clear spatial plan under One Map Initiatives		Fiscal incentives for local governments to support ERC
Renewable Energy Options in Kalimantan	USD 1-9 billion or 3-16% regional GDP (scaled up to Kalimantan corridor)	Transparency in grid expansion plans	Debt guarantees and capital grants to renewable energy developers
Assessing four individual RE Projects		Reform of energy pricing system and feed in tariff	Capacity building for project design
KEK Sei Mangkei	USD 870 million	Reform of energy pricing and feed in tariff to enable solar PV investment	Design PPP scheme for investment in hazardous waste management facility
		Provide financial support of RSPS Certification for smallholders	

4.3 Stages of eCBA

Full eCBA analysis aims to provide evidence-based value estimates of all costs and benefits, including social and environmental ones. As a result, this process requires considerable data, time and skills. Therefore, it is important to note that conducting eCBA is as much a stakeholder engagement process as it is a quantitative tool consisting of data collection and calculation. The quality of eCBA depends very much on data availability (Figure 10). Availability and disclosure

of firm and project-level data will result in a more accurate analysis and more credible estimated monetary values of green growth benefits. For some activities, it is also possible to apply the basic concepts of eCBA while relying on expert opinion for estimates. In these cases, the objective of the analysis is not to give strongly defensible quantitative evidence, but rather to encourage explicit agreement about costs and benefits and to facilitate discussion amongst experts.

Figure 10. The eCBA process



The extended cost benefit analysis attempts to apply a total economic value framework. In this way, project planners ensure the inclusion of social and environmental externalities, expressed as monetary terms in feasibility studies. The basic principles and methodology of conventional cost benefit analysis are still used in the eCBA. The objective is to value negative (costs) and positive (benefits) impacts on stakeholders, expressed in monetary terms across regions and time periods.

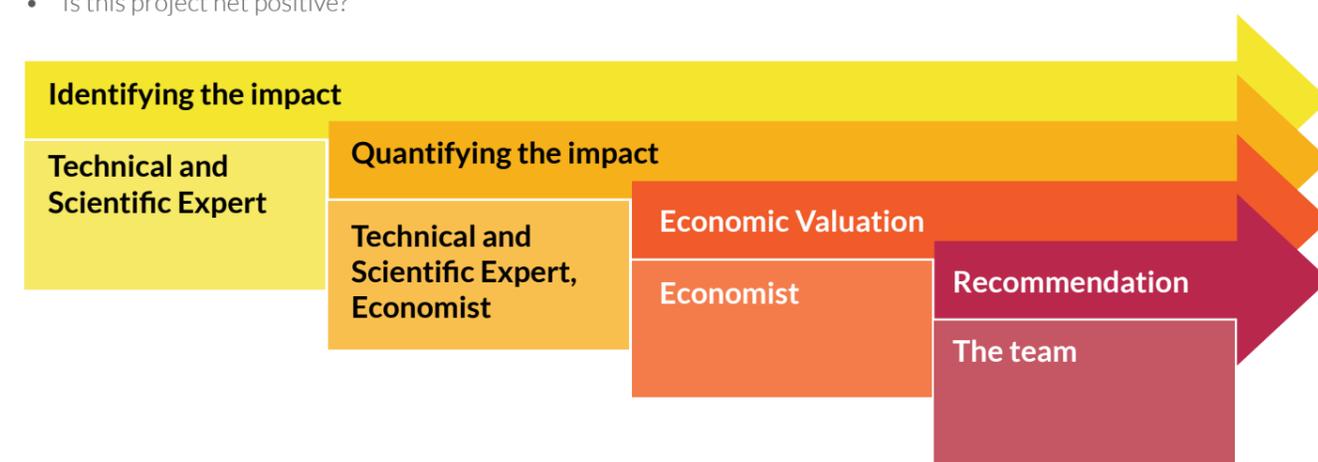
- What is the balance of social, economic, and environmental benefits?
- What is the distribution of private versus public benefits?

Expertise Needed

Expertise from multidisciplinary team is needed to conduct whole process of eCBA, starting with identifying and quantifying the impact, conducting economic valuation and giving recommendations.

The following questions are relevant:

- Is this project net positive?



4.3.1 Study Sites Delineation

Study Site Delineation

Study site delineation is a critical part of the CBA study. In this step, the situation of the project is analyzed so that all environmental impacts are accounted. There is no standard technique in creating the study site delineation. There is also no administrative limit to the question. For instance, if the project affects water quality in a river flowing through two countries, then those two countries should be defined as one site. The same condition applies to air pollutant generated in one city affecting other cities.

Errors in specifying geographic scope can lead to estimation errors of the costs and benefits of a project. There is no easy rule to specify the geographical scope appropriately. A good practice is to input all the impacts of a project in the analysis, without considering the legal limit. To inform decision makers, it is worth classifying the impact based on: (a) the inter-local community where the project is implemented, (b) other local communities in the city/district/same province, (c) other provinces in the same country, and (d) the different countries.

Identifying Standings

Standings refer to whose costs and benefits would be included in the analysis. Following the study site delineation, the basic rule is that benefits and costs to all people within the study site delineation should be considered. Benefits and costs to all nationals should be included while those of non-nationals should be included if the policy relates to, for instance, transboundary pollution or there is some ethical reason for counting benefits and costs to non-nationals.

Consider the following: the road construction project in South Kalimantan will reduce travel time between City A and City B. Many non-Kalimantan people travel between City A and City B. Are the non-Kalimantan included in the analysis? Are we going to take their benefits into account?

Defining Status Quo

The first step is to get an accurate picture of the project as it is currently planned. This is the conventional scenario. In this phase, researchers carrying out an eCBA assess all the available information and preliminary data about the project. This might include the review of the following documents:

- Financial appraisal documents
- Engineering documents (DED)
- Spatial plans
- Master plans

The conventional scenario represents the “without project” situation or scenario. A CBA is undertaken to compare a “with project” scenario (or a set of “with project scenarios”) and the BAU or “without project” scenario. It is important to emphasise

that eCBA is not used to compare “before” and “after” situations, but rather sets of conditions that are predicted to prevail with and without a project.

Defining Proposed Condition

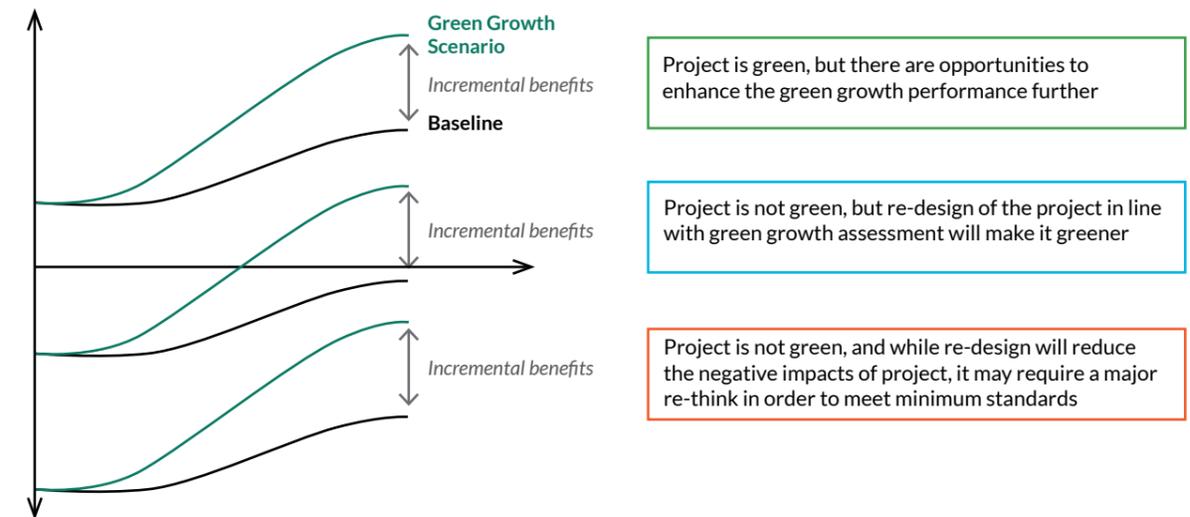
Once a green growth scenario with specific policy has been identified, we need to anticipate the potential impacts these interventions might have on the environment, the economy and society as a whole. Once the BAU has been identified, planners need to identify interventions and policies that can make the project contribute to greener outcomes. The following questions provide a good starting point:

- Are there opportunities to re-design the existing project or policy to enhance green growth performance?
- Does the project intervention offer net positive benefits, and should it proceed?
- What are the synergies and trade-offs in re-designing a project?
- How much capital investment is needed to achieve the improved performance?
- Are there policies that might drive better outcomes for this and other projects?
- What specific policy instruments and financing options are needed to drive green investment and behavioral change?

Figure 11 shows how a project-level eCBA can be used to estimate the difference between current plans and green growth scenarios. The horizontal line represents the minimum threshold at which a project can be considered contributing to a green economy. Incorporation of green growth values in project appraisals can lead to higher estimates of community (monetized) values and benefits, compared to more conventional project designs or plans. eCBA is the tool through which these additional benefits can be assessed and incorporated in the analysis. Key activities to determine the green growth options include:

- Local/national and international literature review
- Speaking to sector experts about technologies and economical/environmental impacts and possible mitigation measures
- Speaking to communities, community representatives, and NGOs about potential social and environmental impacts as well as possible mitigation measures
- Speaking to national/regional planners and industry/industry associations about wider economic development opportunities

Figure 11. Measuring BAU against Green Growth

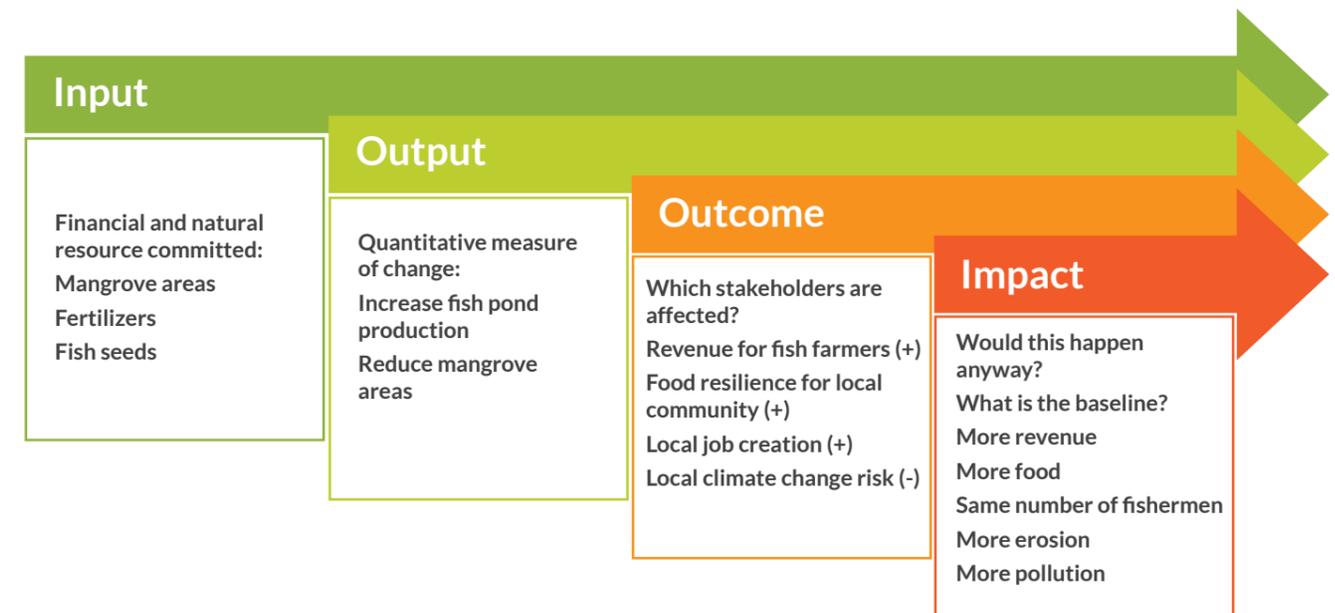


Analyzing Impact Pathways

Impact pathways are used to describe the linkages between interventions (activities), the expected outputs from those activities, as well as the positive and negative outcomes that are generated in the short and long term. Impact pathways need to be mapped for both BAU and Green Growth Scenarios. The total impact of such a policy can be evaluated along a chain of potential impacts. Figure 12 gives an example of creating fishponds in mangrove areas. When designing impact pathways,

eCBA consultants anticipate a ‘value chain’ of impacts a project can generate. They need to look at the kind of financial and material inputs (i.e. resources) needed to build these ponds. Then they need to think about what physical output will be produced and how it can be measured as accurately in quantitative terms as possible. A major outcome of the project is the social effect on stakeholders. Finally, the total impacts of the project intervention are then evaluated when compared to the BAU scenario (illustration in Figure 12).

Figure 12. The Impact Pathway of Fish Ponds in Mangrove Areas





The next step is to collect the data to value the impact pathways. This will be done via an extensive literature review and engagement with national and local stakeholders. The use of local primary data is preferable, but often it is lacking. Thus, international data that is adjusted to local context is used to fill in the gaps. Examples of data sources can be seen in Table 3.

Table 3. Examples of Data Sources Used in eCBA

CATEGORY	DATA	POTENTIAL DATA SOURCES	
		INDONESIA SPECIFIC SOURCES	INTERNATIONAL SOURCES
 Technology	<ul style="list-style-type: none"> • Input requirements (materials, land, labor, fuels) • Investment and running costs • Levels of output per \$ input (tons of production, etc.) 	<ul style="list-style-type: none"> • BPS • BPPT 	<ul style="list-style-type: none"> • GGGI • IEA
 Social	<ul style="list-style-type: none"> • Willingness-to-Pay surveys • Income/health/education/unemployment levels • Healthcare costs/costs of disease • Social return on education 	<ul style="list-style-type: none"> • BPS • Ministry of Manpower, Health, Social Affairs 	<ul style="list-style-type: none"> • UNDP • ILO
 Economic	<ul style="list-style-type: none"> • Product prices and transport costs • Multiplier effects 	<ul style="list-style-type: none"> • BPS • ISPO • Bank Indonesia • Ministry of Finance 	<ul style="list-style-type: none"> • World Bank • ADB
 Environmental	<ul style="list-style-type: none"> • Pollutant output ratios (tCO₂, SO_x, BOD, etc. per ton of production) • Local environmental characteristics (population, weather, hydrology) • Ecosystem services affected and their value 	<ul style="list-style-type: none"> • Environmental Quality Index (Ministry of Environment) 	<ul style="list-style-type: none"> • WWF • RSPO • FAO • UNEP

Figure 13. Impact Pathway of an Economy That Does Not Value Natural Capital

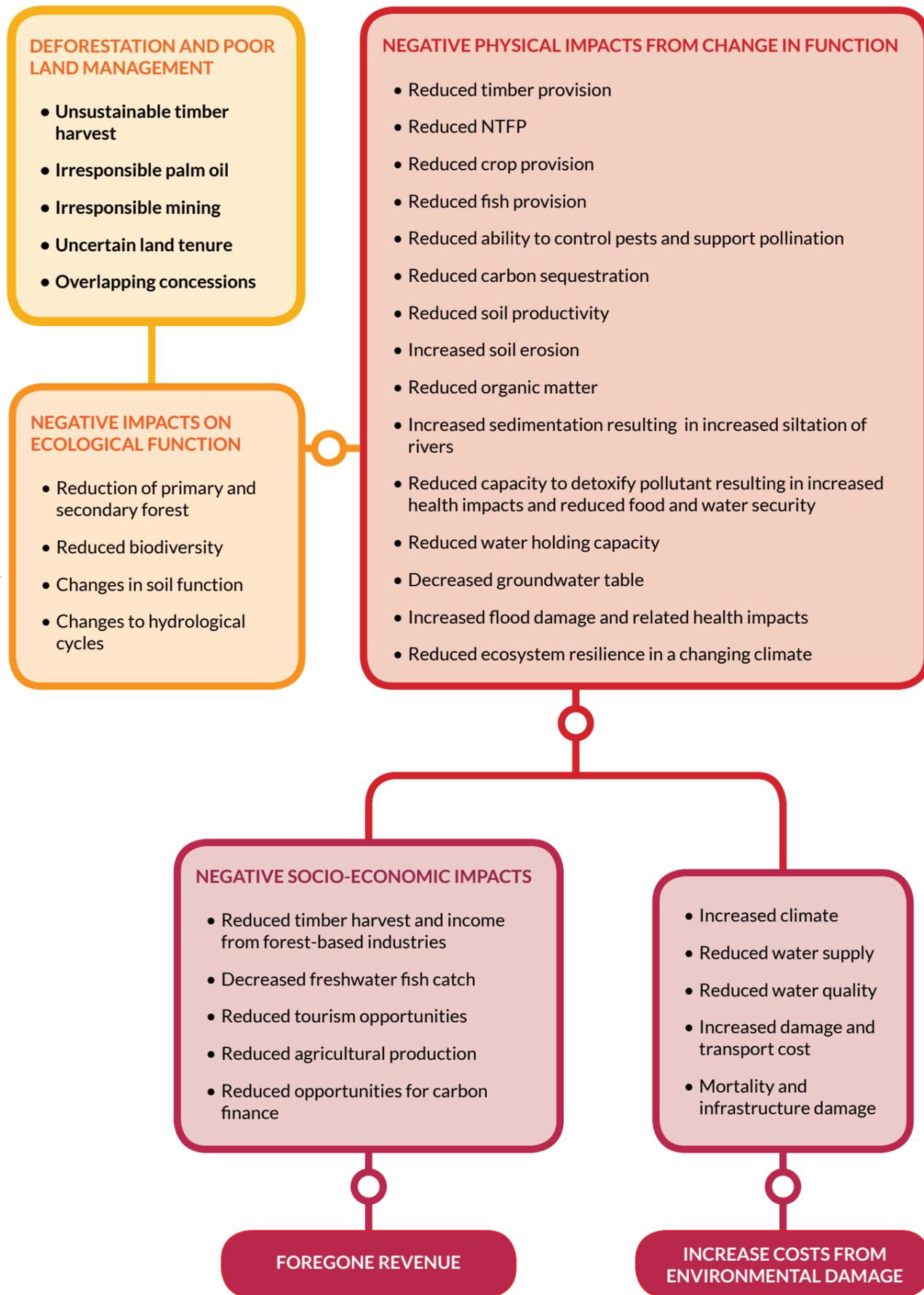
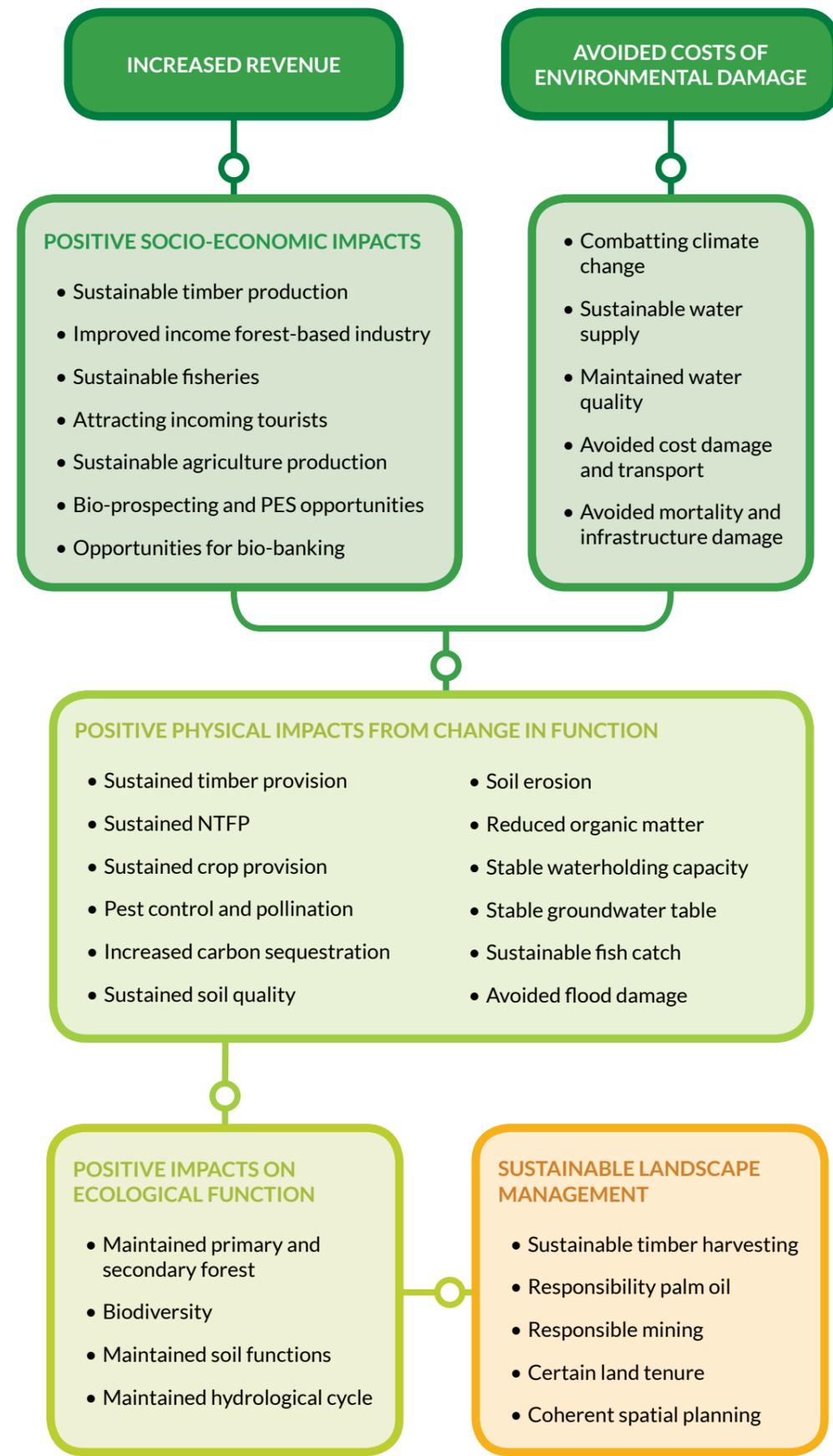


Figure 14. Impact Pathway of an Economy That Does Value Natural Capital (continued)



4.3.2 Identifying Potential Project's Impact

To identify potential project's impacts, we might begin by making a list of all the impacts of project, including the required input (e.g. labor, capital, etc.) and all of the output from the project (Figures 13 and 14). If a project (or activity) is to improve access to sanitation, improve waste management, or reduce the frequency or expansion of the flood, then to present the potential benefits and costs in eCBA, we must first make a list of all side effects associated with lack of sanitation, lack of good waste management, or flood. Possible barriers in conducting this step are: (a) many of the impacts are unknown, (b) science is incomplete and often contradictory, (c) incomplete data. When the data is not available, it can be extrapolated from: (a) available time series data, (b) lessons learned from similar projects in other places, and (c) advice from technical experts.

4.3.3 Quantifying Potential Impact (with and without project)

This step is probably the most important step and most common eCBA failure. The main question to ask is what will happen if the project is not implemented. We should compare the situation that could occur in the "no project" and the "without the project". For example, in an area of a country where a project would have an adverse impact on fisheries. However, the fishery in this area has decreased in the past few years (perhaps as a result of over-fishing). Without proper analysis, we cannot claim that the project will not have a negative impact on fisheries.

4.3.4 Monetizing Impacts

After identifying a potential project's impacts and quantifying the potential impacts (stages 2 and 3), all the physical effects need to be transformed into monetary value. This value can be monetized by assessing the individual's willingness to pay (WTP) or willingness to accept (WTA) for all goods and services affected by the project/policy. Remember that we must include all the project/policy's impacts, both positive and negative.

These values can be acquired by two possible ways: directly or indirectly. The first possibility is goods or services affected by the project/policy may be traded on the existing market, so the market prices for goods or services are available. All we need to do is ensure that the market price reflects the WTP or WTA for those goods or services, and only then can we use them. If they are not reflected, we must find a way to measure the economic value.

Meanwhile, the second possibility is the absence of a market that trades the goods or services affected by the project/policy, so no market price is available for those goods or services. Despite the absence of market prices, we need to estimate the WTP and/or WTA for these goods and services.

When Market Price Is Available

The market price of input and output will measure the economic value (costs) of input and the economic value (benefits) of output if the market is perfectly competitive. This means there is no monopoly and no distortion, such as taxes, subsidies, price control, etc. In such cases, we can use the market prices as they are observed to measure the costs and benefits of a project. However, in many cases, the market is not perfect. The market is not competitive, and there are many distortions. In this case, market price does not reflect the real economic value (costs) of input and economic value (benefits) of output. Therefore, the market price should be adjusted to conduct eCBA. This adjusted market price is known as shadow prices.

When Market Price Is Not Available

The environment and ecosystems produce goods and services that are beneficial to humans, i.e. contribute to human welfare or are 'valuable' for humans. Human behavior influences or affects the structured and process (i.e. functions) as well as goods and services produced by ecosystems. Our understanding of goods and services that are provided by ecosystems and the impact of human behavior on the provision of goods and services are not perfect and difficult to quantify due to the complexity and dynamics of ecosystems.

Total Economic Value (TEV) represents the value derived by people of any environmental goods and services. In general, TEV is divided into two types of values: **use** and **non-use values**. **Use values** is the direct value of the use of environmental goods and services. It can be divided into three categories. First is **direct use value**: the value of ecosystem

services that are directly accessed and used by humans. For example, fish harvested from the sea, timber harvested from the forest, water taken from the river, and beautiful scenery of the coral reefs. Some of the use of value of ecosystem services are not reflected in the market price. Second is **indirect use value**: the value of ecosystem services that have indirect functions to humans. For example, the function of mangroves to protect us from storms and abrasion. Although ecosystems provide important functions to society, almost all kinds of 'hidden' functions of ecosystem services do not have market price. Third is **option value**: the value of the future ability to use the resource. For example, if you have never been to Raja Ampat, Papua, but you plan to go there in the future, you are considered to place value on the ecotourism services of Raja Ampat.

Non-use values try to capture the willingness to pay for environmental goods and services that will never be used. Non-use values are divided into three categories. First is **existence value**, which is considered as pure non-use value. It measures the willingness to pay to ensure that the environmental goods and services continue to exist. Second is **bequest value**: the willingness to pay to ensure the environmental goods and services are still available for our descendants. Compared to use value, non-use values are much more difficult to monetize.

The eCBA process tries to capture the total economic value that a project generates. In practice, project planners employing the eCBA method make the most use of readily available secondary data on direct and indirect use value. However, in many cases, non-use values are very difficult to obtain due to the lack of primary research applying total economic valuation techniques. One of the most frequently used valuation techniques to estimate non-use value is contingent valuation. It simply asks people about their **willingness to pay** the non-use value of ecosystem services.

Ideally, the total economic value of natural capital and their services consists not only of use values, but also of non-use values determined by the willingness to pay of various actors. If non-use values are ignored by project planners, then this could lead to an under-estimation of the benefits that ecosystem services can provide and in turn to continued over-use of natural resources. In practice, however, many analysts face difficulties in estimating non-use values.

Available environmental valuation methods to be used in eCBA are detailed in Chapter 5.

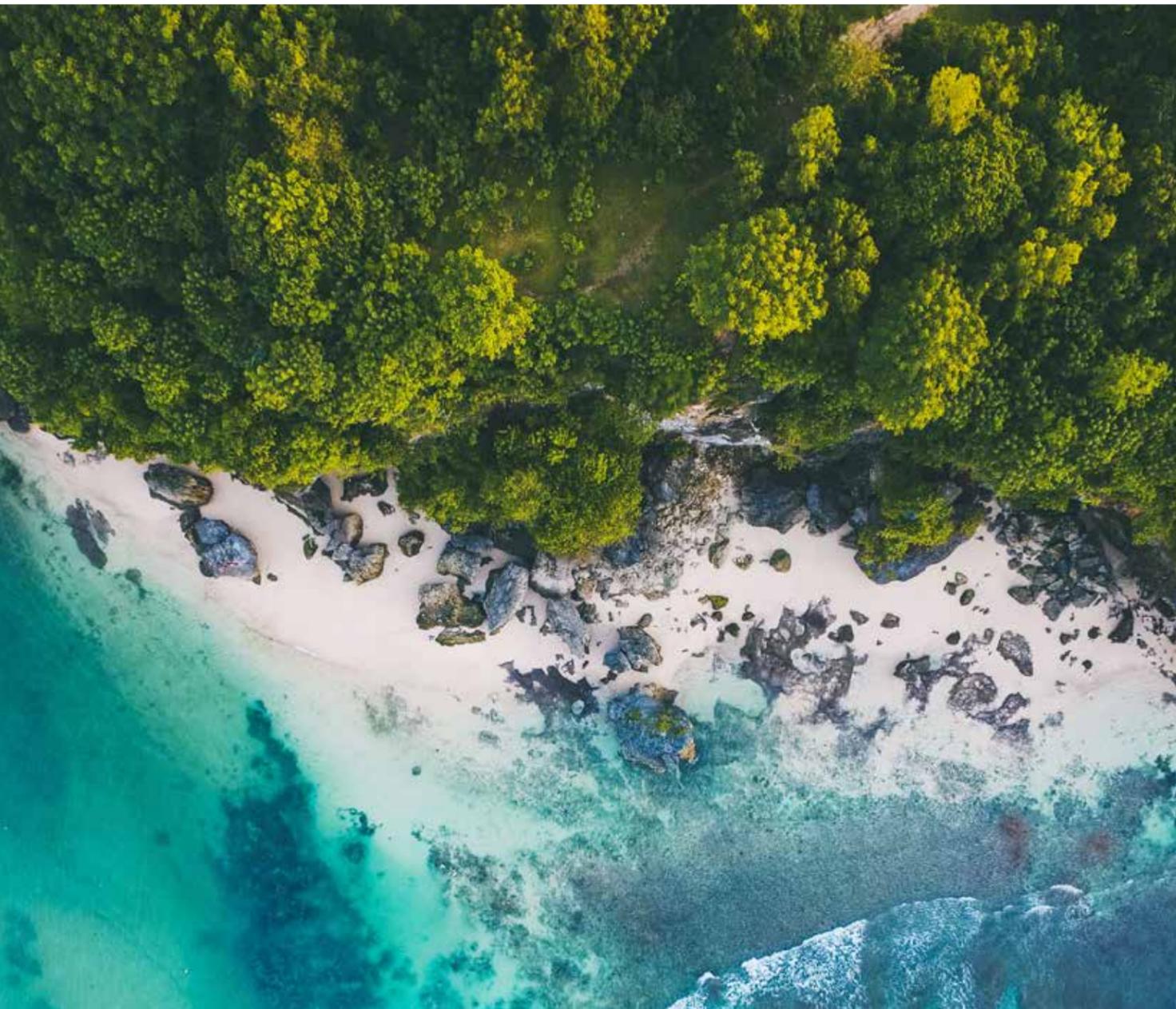
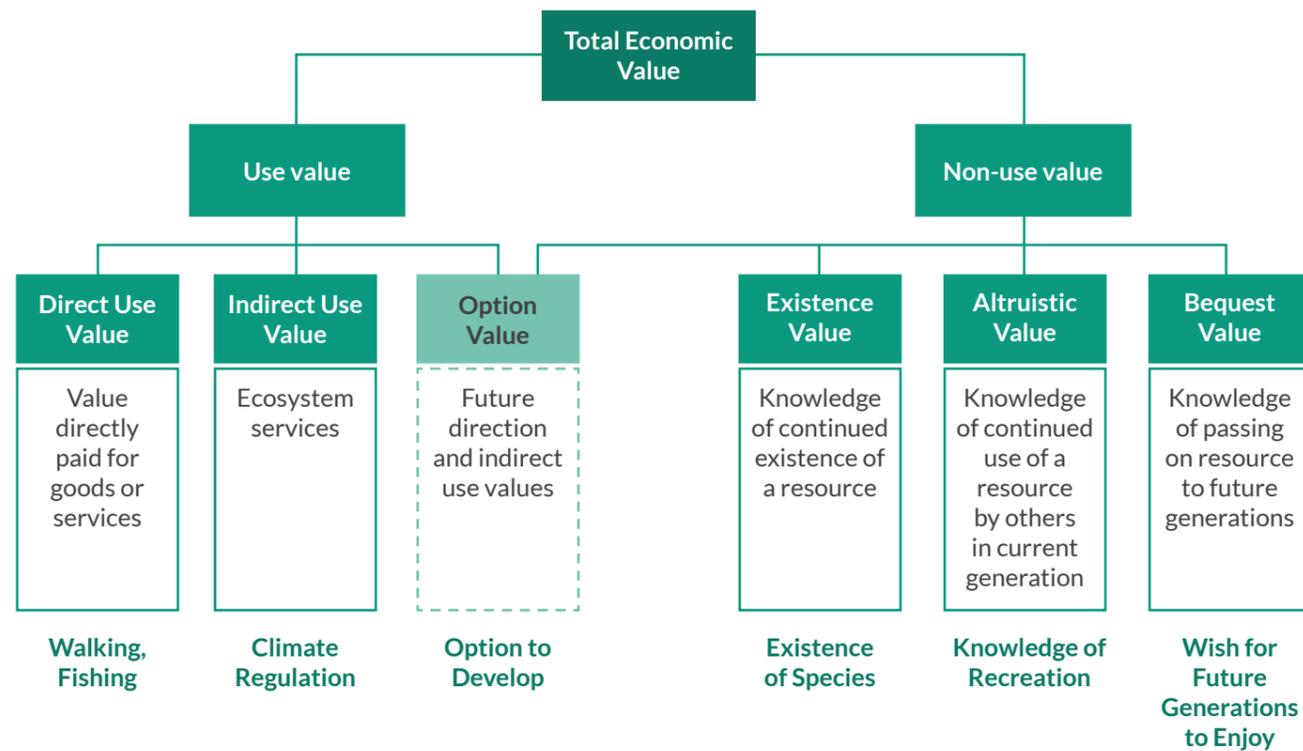


Figure 15. Total Economic Value Framework Used in Environmental Valuation Proses



4.3.5 Calculating Net Present Value

To decide whether a project is preferable to another, we need evaluation criteria. Two of the most important criteria are the expected net present value of net benefits as well as the complementary values of benefit cost ratio and internal rate of return.

Net Present Value (NPV)

Net present value is one criterion in choosing a project by looking at the factor that gives the biggest net benefit in the duration of the project. The net benefit is calculated by subtracting benefits from the costs. In the project, the benefits and costs occur at different periods. Since they do not appear at the same time, we have to incorporate time in calculating net benefit. The net benefits that incur in different time periods must be valued by discounting the present value. The need for discounting appears due to the premise that the same amount of values in the future are worth less than today.

Discounting incorporates the time value of money. If we invested Indonesian Rupiah (IDR) 1.1 million today at 10 percent interest rate, it would generate IDR 1.1 million a year from now. Thus, the present value of IDR 1.1 million a year from now is IDR 1 million.

The table below demonstrates what we expect to have by investing IDR 100 million in the first two years of a project that yields a return of IDR 50 million each year, assuming the discount rate is 10 percent and the project duration is five years. The investment is divided equally within the two years. In the first two years, the present value of the net benefit will be negative as there is no benefit generated from the project yet. The net present value of the first year is the same with the value of the cost incurred since there is no need to discount the value that appears today. In the later year, the value will decrease due to discounting (the value incurring next year is worth less today). From the third year onwards, the present value of the net benefits will be positive. Aggregating these numbers generates a positive net present value of the whole period of the project (IDR 40 million).

Table 4. Demonstrating NPV Calculation (in IDR)

Year	1 (today)	2	3	4	5
Benefit			60,000,000	60,000,000	60,000,000
Cost	50,000,000	50,000,000			
Net Benefit	-50,000,000	-50,000,000	60,000,000	60,000,000	60,000,000
Present Value of Net Benefit (r=10%)	-50,000,000	-45,454,545	49,586,777	45,078,888	40,980,807
NPV	40,191,927				

The formal formula of the net present value is described below:

$$NPV = PV \text{ of Benefits} - PV \text{ of Costs}$$

$$NPV(i, N) = \frac{B_t - C_t}{(1+i)^t}$$

B= Benefits

I=Financial or economic discount rate

C= Costs

t= Number of years for which a project will operate

If the NPV is positive, the project is feasible. When there are more than one alternative projects, then the rule becomes: select the project with the largest NPV.

Social Discount Rate

What kind of discount rate should we use? If we are an investor, we are concerned about our financial performance. Thus, we prefer to conduct a financial CBA. For this type of CBA, the appropriate discount rate is the opportunity cost of the capital. The discount rate should reflect the time value of money from the investor's perspective. Thus, several types of discount rates can be used, e.g. interest rate in the financial market or the average return of the stock market. We call it private discount rate.

However, if we look at society's perspective at large, we may use what is called the **Social Discount Rate (SDR)**. Social discount rate will more likely have a much lower discount rate since society may take longer in reviewing the benefits and costs of the project than the private sector.

Benefit-Cost Ratio (B/C Ratio)

B/C ratio is simply the ratio of benefit over cost. This ratio is calculated by dividing the total discounted value (PV) of benefits by the total discounted value (PV) of costs.

$$B/C \text{ Ratio} = PV \text{ of Benefits} / PV \text{ of Costs}$$

If the B/C ratio is greater than one, then the project indicates that the PV of benefits outweigh the PV of costs. Table 5 illustrates the computation of B/C ratio. However, this ratio is only useful for finding out whether the benefit of a project exceeds the cost. Moreover, it is a poor indicator for comparing projects, particularly at different scales. We should be careful in interpreting different B/C ratio from different projects due to the possibility that a project with higher B/C ratio generates smaller NPV. Thus, B/C ratio is a misleading indicator for choosing a project from different alternatives (see Table 5).

Table 5. Demonstrating B/C Ratio Calculation (in IDR)

Year	1 (today)	2	3	4	5	sum
Benefit			60,000,000	60,000,000	60,000,000	180,000,000
Cost	50,000,000	50,000,000				100,000,000
Present Value of Benefit			49,586,777	45,078,888	40,980,807	135,646,472
Present Value of Cost	-50,000,000	-45,454,545				-95,454,545
B/C ratio	1.42					

Table 6. NPV, B/C Ratio and IRR of Project A (in IDR)

Year	1 (today)	2	3	4	5	Sum
Benefit			60,000,000	60,000,000	60,000,000	
Cost	50,000,000	50,000,000				
Present Value of Benefit			49,586,777	45,078,888	40,980,807	135,646,472
Present Value of Cost	-50,000,000	-45,454,545				-95,454,545
Present Value of Net Benefit (r=10%)	-50,000,000	-45,454,545	49,586,777	45,078,888	40,980,807	
NPV	40,191,927					
B/C ratio	1.42					
IRR	16%					

Table 7. NPV, B/C Ratio and IRR of Project B (in IDR)

Year	1 (today)	2	3	4	5	Sum
Benefit			6,000,000	6,000,000	6,000,000	
Cost	5,000,000	5,000,000				
Present Value of Benefit			4,958,678	4,507,889	4,098,081	13,564,647
Present Value of Cost	-5,000,000	-4,545,455				-9,545,455
Present Value of Net Benefit (r=10%)	-5,000,000	-4,545,455	4,958,678	4,507,889	4,098,081	
NPV	4,019,193					
B/C ratio	1.42					
IRR	16%					

Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is the discount rate that ensure the NPV is at least zero. Private investors typically want the IRR of a project to be at least the same as the private return on the alternative investment in other assets, such as the stock market, government debt, or other projects. From a societal point of view, it is a good project if the IRR is greater than the rate of return or social discount rate. If the IRR is less than the rate of return or social discount rate, then we should not proceed.

The problem with IRR is that it may be possible to have more than one IRR from a project. This kind of problem may arise when annual net benefits change more than once from positive to negative (or vice versa) during the discounting period. IRR is also not a good indicator for selecting the best project from the available alternatives, since, like the other kind of ratio indicators (e.g. benefit-cost ratios), it fails to take into account the different scales of projects (see Table 6 and Table 7).

The two tables (Table 6 and Table 7) compare two different projects, Project A and Project B. The two projects yield exactly the same value of B/C ratio and IRR. However, the NPV is largely different. If somehow Project B yields a slightly different value from Table 7 (higher than Table 6), using only B/C ratio or IRR would lead to a different conclusion – that Project B is better than Project A, given Project A most likely still has much higher NPV than Project B.

Note: When adjusting for inflation the NPV needs to use a real discount rate:

$$r = [(1+i) / (1+ \pi)] - 1 \text{ where } \pi = \text{inflation rate}$$

In conclusion, NPV, B/C ratio and IRR can be used to determine whether a project is feasible or not. However, in selecting a project from more than one alternative, the NPV is the most appropriate criterion. The other two – B/C Ratio and IRR – can be used as complementary criteria for selecting a project.

4.3.6 Calculating Expected Value and Sensitivity Analysis

The value of NPV from the calculation as described previously can be considered as an ‘expected’ value. The term ‘expected’ means that the value is not certain because it depends on the occurrence of specific contingencies. Once the results of the eCBA are calculated, discussions with key stakeholders are needed to confirm the accuracy and reliability of the results. The more open and transparent the model and the findings are, the greater the credibility of the eCBA study is.

To validate findings, several steps need to be carried out. First, determine the degree of accuracy. This step will generate a range of expected value of a certain level of confidence. For example, we are 90 percent confident that the expected value/ NPV of the project – given the assumptions – is between IDR 100 million to IDR 150 million. Second, conduct a sensitivity analysis to see if changes in assumption of important parameters will change the range of expected value generated in the first step. The parameters that could be changed are discount rate, input cost, price, etc. Third, disclose assumptions that are used in sensitivity analysis to key stakeholders and experts to check the validity. Highlight where international or other data is used in proxy of local data.

Sensitivity Analysis

Every assumption that is used in a CBA varies due to uncertainty in future real conditions. Thus, the expected value of net benefit that we have from the calculation is vulnerable to change. We need to consider the most important assumption that could impact the result. Sensitivity analysis provides information on how sensitive the net benefits/NPVs are to changes in assumption. If the sign of the net benefit (positive or negative) does not change as the assumptions change within a reasonable value, we could have more confidence in the result.

To make judgement on what assumptions and what value range are used in the CBA, we can ask experts, project owners, and other stakeholders of the project. In the end, we must decide on the most important assumption(s) to be included and what range of values to be used in our CBA. This means that CBA could be biased. We should provide the relevant argument in providing assumption and range value to ensure that the user of the CBA understands our perspective.

There are some approaches in demonstrating sensitivity analysis. First, conduct a partial sensitivity analysis. This analysis aims to estimate how net benefit changes as we change a single assumption while holding the others constant. The assumptions used in partial sensitivity analysis are the ones that are considered as the most important and uncertain assumptions. The analysis allows us to find what

assumption value gives us net benefit equal to zero or a break even position.

Second, conduct worst and best case analyses. Here, we try to look at what combination of reasonable assumptions change the sign of net benefits. The analysts need to know what would happen in the best scenario and the worst scenario, using assumptions ranging from optimistic to pessimistic or the most conservative value.

Third, conduct a Monte Carlo sensitivity analysis. The analysis is useful to draw a conclusion on the risks of the project, using the values underlying the key assumptions as a probability distribution. The distribution of the net benefits represents information on how risky the project is, simply by looking at the percentage of negative numbers compared to the positive net benefits.

4.3.7 Policy recommendation

Policy recommendations should be based on a proposed regulatory design. If the future policy targets disadvantaged groups or impoverished areas within countries or states, or if it explicitly treats different income groups differently, before designing the proposed policy, we need to consider its potential impacts on those groups. Both costs and benefits need to be segregated into groups in question.

Policy Design

In the final stage, project planners need to provide recommendations on how best to design policies to maximize the green growth performance of this project and across the economy. The main objective is to attract investment that will support the implementation of the identified green growth interventions. The recommendations should identify enabling, incentive-based, and investment policies that might be needed to attract investment. Ideally, the eCBA could provide the foundation for a business case for the government to showcase to potential investors.

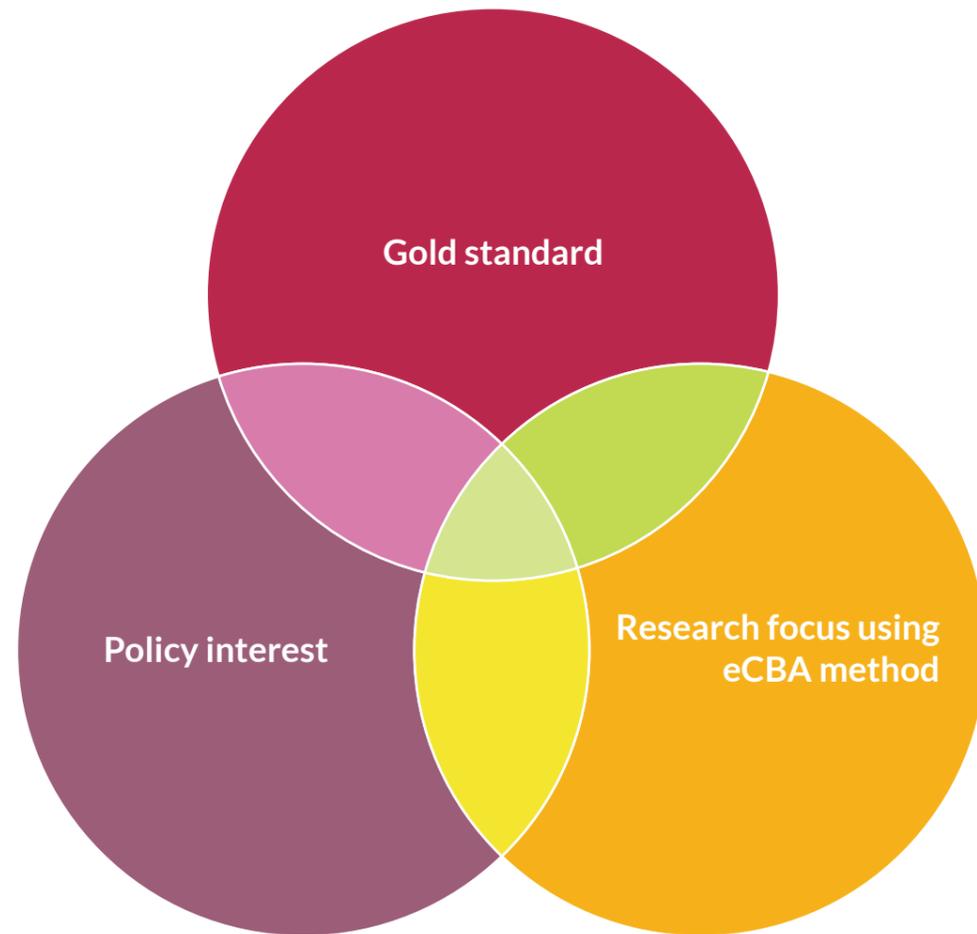
Policy vs eCBA

Before designing a policy based on the results of research using the eCBA method, we need to step back to understand the difference between policy and research. Table 8 provides a summary of differences between policy formulation and research by comparing the scale, objective, impacts, political influences, and requirements. To achieve a gold standard policy, it should be formulated according to the policy interest and research focus (Figure 16). Otherwise, the policy will not be operational because it does not align with policy interest. It might also not be reliable because it is not based on a good research focus/method.

Table 8. Difference Between Policy Formulation and eCBA

	POLICY	eCBA
Scale	Large	Small
Objective	Resolving issues of public interest	Answering research questions using eCBA method
Impact	Large	Small
Political	Yes	No
Requirement	Can be implemented Based on good research	Replicable Based on good research

Figure 16. Gold Standard of Research Focus and Policy Interest

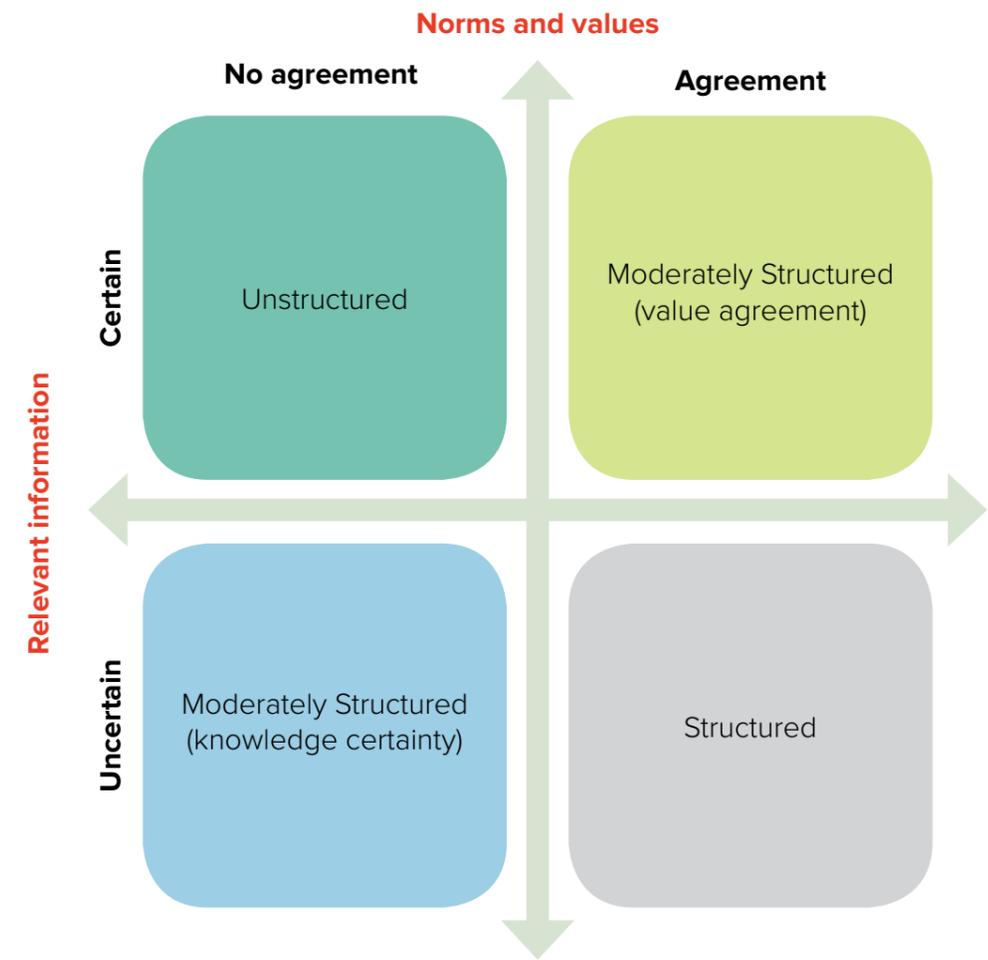


Policy Issues

Policy issues can be grouped into four quadrants (Figure 17). The axes are norms and values as well as available relevant information. When relevant information is available and certain, and there is agreement in norms and values, policy issues are very easy to resolve. Unstructured policy issues will lead to a problematic decision-making process. The eCBA is important to ensure that decision-making meets all conditions (Table 9). When all decision makers are ready to solve the policy issues, research can be used to provide scenarios with all the implementation framework.

When the decision makers do not have a uniform understanding of the policy issues, research can be used to unify understanding and gather important information needed to translate knowledge into easy to understand language for decision makers. When decision makers do not have enough understanding or priority, assistance is needed to build a long term vision and road map.

Figure 17. Resolving Policy Issues Under Four Types of Circumstances



Source: <https://onthinktanks.org/articles/understanding-policy-problems-and-their-implications-in-your-research-decisions>

Table 9. The Role of Research Using eCBA Method for Various Conditions

	HIGHLY STRUCTURED	STRUCTURED (Value Agreement)	STRUCTURED (Knowledge Certainty)	UNSTRUCTURED
Description	Stakeholders are ready to tackle the issue	Stakeholders share values, but have opposing knowledge	Stakeholders do not agree on their values or priorities	Stakeholders do not have knowledge or priorities
Research role	Show options for policy design and how it can be implemented: <ul style="list-style-type: none"> • Financing • HR Capacity • Knowledge • Maintaining Support (if needed) 	Make sense of existing knowledge: <ul style="list-style-type: none"> • Gather front-line evidence • Explain the existing research • Knowledge translation 	Bring stakeholders together, find common ground: <ul style="list-style-type: none"> • Accommodating solutions • Long-term research agenda 	Prioritize and structure parts of the problem to move forward: <ul style="list-style-type: none"> • Front-line knowledge • Developing new visions • Build frameworks



Research Questions vs Policy Questions

Research questions are not the same as policy questions. Below are examples of policy questions: (1) How much of the budget should be allocated for low income households; (2) Where are the most strategic delineation locations to be developed; and (3) What important commodity must receive attention in financing?

Reformulation of policy questions into research questions for low income households are: (1) Definition, classification, references used; (2) Quantity, distribution, number per location; (3) How to distribute, best practices from other countries; and (4) How to alleviate poverty, live experiments in the field.

The steps are as follows¹⁰: (1) Identify policy objectives, (2) Policy reconstruction, (3) Workshop to determine policy objectives, (4) Determine research questions for each policy focus, (5) Define methods to answer research questions, (6) Construct research design, and (7) Focus enhancement to answer prioritized research questions.

Regulatory design

The OECD (1995) has developed a checklist of regulatory design, where policy makers need to ask 10 questions prior to a decision to choose or implement new policies.

Question 1: Is the Problem Correctly Defined? The problem to be solved should be precisely stated, giving clear evidence of its nature and magnitude, and explaining why it has arisen.

Question 2: Is government action justified? Government intervention should be based on clear evidence that government action is justified given the nature of the problem, the likely benefits and costs of action (based on a realistic assessment of government effectiveness) and alternative mechanisms for addressing the problem.

Question 3: Is regulation the best form of government action? Regulators should carry out – early in the regulatory process – an informed comparison of a variety of regulatory and non-regulatory policy instruments, considering relevant issues such as benefits and costs, distributional effects, and administrative requirements.

Question 4: Is there a legal basis for regulation? Regulatory processes should be structured so that all regulatory decisions rigorously respect the “Rule of Law”; that is, responsibility should be explicit for ensuring that all regulations are authorized by higher level regulations, are consistent with treaty obligations, and comply with relevant legal principles, such as certainty, proportionality, and applicable procedural requirements.

Question 5: What is the appropriate level (or levels) of government for this action? Regulators should choose the most appropriate level of government to act or, if multiple levels are involved, should design effective systems of coordination between levels.

Question 6: Do the benefits of regulation justify the cost? Regulators should estimate the total expected costs and benefits of each regulatory proposal and of feasible alternatives and should make estimates available in accessible format to decision makers. The costs of government actions should be justified before action is taken.

Question 7: Is the distribution of effects across society transparent? To the extent that distributive and equity values are affected by government intervention, regulators should make transparent the distribution of regulatory benefits and costs across social groups.

Question 8: Is the regulation clear, consistent, comprehensible and accessible to users? Regulators should assess whether rules will be understood by likely users, and to that end should take steps to ensure that the text and structure of rules are as clear as possible.

Question 9: Have all interested parties had the opportunity to present their views? Regulations should be developed in an open and transparent fashion, with appropriate procedures for effective and timely input from interested parties, such as affected businesses and trade unions, other interest groups, or other levels of government.

Question 10: How will compliance be achieved? Regulators should assess the incentives and institutions through which the regulation will take effect and should design responsive implementation strategies that make best use of them.



¹⁰<https://onthinktanks.org/articles/research-questions-are-not-the-same-as-policy-questions>



Chapter 5 Environmental Valuation

Recalling Figure 15 in Section 4.3.4 the TEV framework used in environmental valuation process is revised into Figure 18 where environmental valuation methods are added to the bottom of the framework. All available methods are grouped into four groups: **(1) value changes in productivity, representing change in productivity; (2) stated and (3) revealed preference representing change in behavior; and (4) benefit transfer.** The first, second and third groups use secondary and primary data in data analyses stage. It takes time, resources and expertise to implement the methodology.

When there is not enough time and resources, benefit transfer method can be used to shorten the study time.

In this chapter, popular environmental valuation methods are summarized (Table 10). Value Change in Productivity represents Group 1; Travel Cost Method, Hedonic Approach and Averting Cost represent Group 2: Revealed Preference; Contingent Valuation and Choice Modeling represent Stated Preference (Group 3); and Benefit Transfer for Group 4. Every method is detailed in the following sections.

Figure 18. Methods Used in Estimating Use and Non-Use Values for Non-Marketed Goods

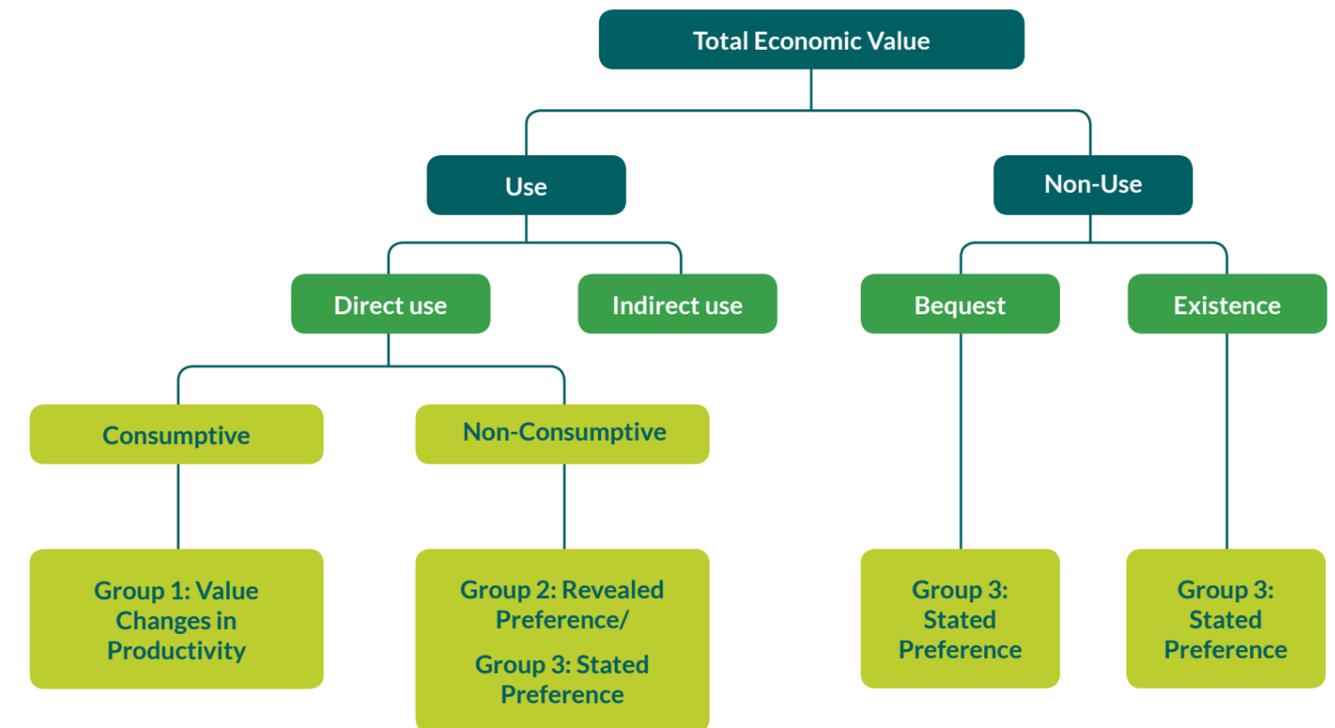


Table 10. Environmental Valuation Methods

GROUP	METHODS	APPLICATION	TYPE OF DATA	WEAKNESSES
1	Value changes in productivity	Provisioning, regulating	Secondary	Only inputs to marketed goods
2	Travel cost method	Recreation	Primary – surveys	Data; recreation only
	Hedonic approach	Disamenities	Secondary	Data; analysis
	Averting cost/defensive expenditure	Provisioning, regulating	Primary	Cost as proxy of benefit
3	Contingent valuation	Use and non-use values	Primary – surveys	Hypothetical
	Choice modelling	Use and non-use values	Primary – surveys	Hypothetical; Data; Analysis
4	Benefit transfer	Use and non-use values	Secondary	Limited by available past studies



5.1 Value Changes in Productivity¹¹

The approach can be used for a wide range of valuation problems. It has been widely used due to its ease of explanation and justification. A limited list of potential scenarios in which the approach may be useful:

- Soil erosion, measuring the decline in on-site crop yields, and the resulting downstream effects, such as blockage of irrigation systems and sedimentation of reservoirs
- Air pollution, measuring its impact on human health or on trees' lost value of production
- Water pollution, measuring its reduced capacity to sustain fish stock affecting fishermen's income

When there is a change in an environmental input, this can lead to a change in the quantity produced. For instance, in the first case or soil erosion, there may be an accompanying decline in the volume of crops harvested. However, it may be possible for the farmer to replace the loss of one input for a substitute input, such as fertilizer. This provides us with two measures for valuing the degradation of land: the value of lost output or the cost of additional resource inputs. Both affect profit (Equation 1).

$$\pi = PQ - c(Q) \quad \text{Equation 1}$$

where, π = profit, P = price, Q = production, and c = cost.

The productivity approach is often very appealing due to its ease of explanation and justification. However, in practice, it can be one of the most challenging exercises. In summary, two steps need to be undertaken: (1) determining the physical impact; and (2) attaching market values to the losses. The first step is the most challenging since we need to disentangle the cause of environmental degradation (i.e. soil erosion) to income from other possible causes, such as labor strike in the same year, change in the price of inputs or the capacity of the soil to maintain crops, or even uncharacteristic weather events in the past year. These economic causes are based on complex biological relationships and need to be understood beforehand. This information can be obtained from: (a) field experiments or (b) statistical analyses using cross section or time series data.

The second step, attaching market values to the losses, is less a controversial method compared to other valuation methods. It is very straightforward where market price is used to value the loss in production, or the cost of increased inputs. However, there are several issues to be considered:

- Market distortion, due to government interventions, such as subsidies, taxes, import protection or monopoly. Where possible, prices should be adjusted to reflect their competitive level
- Where the change of productivity is large enough to affect market price, then the market price should be adjusted to reflect the forecasted price in the absence of the environmental change
- Change in production may alter costs
- The market price only reflects use values. Therefore, this method may only provide a lower bound estimate of the opportunity costs forgone

When the product in question does not have market value, then a number of alternatives can be applied, such as valuing:

- Benefits of the product
- Cost of substitutes
- Cost of increased labor time

5.2 Revealed preference

Revealed preference observes the choices people made and infers values from those actions. Available techniques are travel cost method, hedonic approach/property value hedonics and averting cost/defensive expenditure.

5.2.1 Travel Cost Method¹²

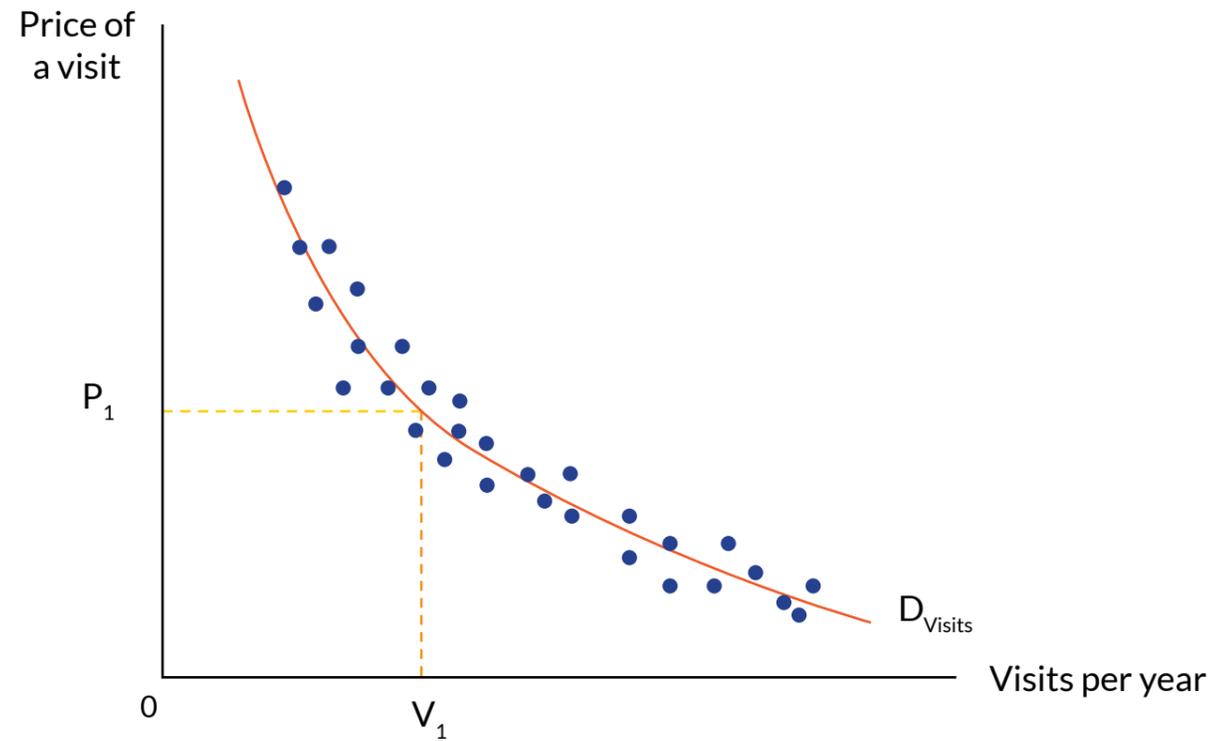
Travel cost method (TCM) belongs to revealed preference method group where people's preference is observed through real expenditure in a recreation site. The method is usually applied when people visit a natural area free of charge or for only a nominal entrance fee. The travel costs act as a proxy for the price of visiting the site, and the "willingness to pay" typically exceeds any entrance fee. The value placed on travel time is usually assumed to be approximately half or one-third of the wages that could be earned over the same amount of time. Another nuance of the method, especially the individual model, is that it can handle valuations where multiple or substitute sites may be visited. The main assumptions used in this method are:

- Benefit of the recreational site can be estimated from demand function for the site
- All recreational activities are grouped according to the nature of the recreation activities. For instance, fishing and watching movies are split into two categories

¹¹Freeman III, Herriges, & Kling, 2014; Growth, 2005.

¹²Hanley & Spash, 1993.

Figure 19. Demand Function for a Recreation Site



Two basic approaches are applied: the individual travel cost model and the zonal model. This method basically values environmental goods using a consumption pattern in a market. The environmental value of a site is estimated using the cost to consume environmental service provided by the site. The cost of consumption includes all costs borne by every respondent since he/she decides to take the trip, travel fares and all in-site expenditures. Estimation of value follows Equation 2.

$$TC = f(\text{fare/km, travel time, entrance cost, demographic variables, type of travel})$$

Equation 2

An alternative method is the zoning model where respondents are grouped based on their origin and the model is estimated for every zone. The final output is a demand depicted in Figure 19, where the number of visits decline is conditional to the rise of travel costs.

A caveat of this method is selection bias of respondents, where respondents are visitors only. Therefore, it is unlikely that linear regression can be used to model the data. Possible econometric models to be applied are log-log, semi-log, or Poisson Regression Model. This method also needs to tackle the many variations of costs borne by respondents, such as type of visits

5.2.2 Hedonic Approach¹³

Property valuation models assess how proximity to various environmental amenities or disamenities influence the amount individuals are willing to pay for real property. For instance, a property's value depends on the attributes of

the neighborhood in which it is located. There is a premise that long term damage to environmental resources could reduce nearby property values. This method uses changes in property values as a proxy for changes in nearby resource values.

The hedonic property valuation approach is used in the damage assessment context. It involves the use of cross-sectional data on property's characteristics in a given area at one point in time. Statistical regression analysis is then used to determine the contribution of each factor to sale price. Hedonic analyses have been conducted at the house-level, using data on individual properties, and at the regional level, using data on average home characteristics across towns and counties. Repeat sale analysis or panel data analysis considers the relative rates of change in housing process between affected and control (unaffected) areas. For instance, comparing the rates of home appreciation before and after an environmental damage occurred or between affected and unaffected areas would produce a measure of property value impacts.

A significant advantage of the property valuation technique is that a reduction in property values can serve as a measure of many lost services associated with a change in environmental quality. The method is based on observable behavior in a market that is well understood. There are a number of limitations associated with this approach:

- Requirement of large amount of detailed data
- Difficulties to separate the effect of environmental damage and its aesthetic impact



- Difficulties to reduce correlation among variables determining market price
- Double count of other categories of damages, such as lost recreation opportunities

However, difficulties in application of this method can be remedied using a very effective, low-cost method of assessing the asset value of an improved environment by asking property valuers or agents on how the value of a property might vary under different sets of environmental conditions.

5.2.3 Averting Cost/Defensive Expenditure¹⁴

An environmental event may add costs on users of the affected resource. Data is required to estimate damages using this technique, including the cost of affected activity pre- and post-event. Generic estimates can be used where site-specific data is not available. Cost of illness is one of the available techniques that belongs to this group of methods.

Cost of Illness

Cost of illness (Col) is a specific method to estimate economic impact of a type of disease in a social welfare framework. This type of study aims to itemize, value, and sum the costs of particular problems with the aim of giving an idea if it is an economic burden. Steps used in Col are: (1) identification, (2) listing, (3) measure, and (4) value the cost of one disease and other possible related diseases. The main assumption is that there is a potential benefit of a health care intervention if it had eradicated the illness. There are two monetizing categories in place: (1) direct and (2) indirect monetization. Direct monetization uses:

- Healthcare costs for diagnostics, treatment, and rehabilitation
- Non-healthcare costs, such as for transportation, reallocation, property loss, and other informal costs

Indirect costs are mainly related to reduced productivity caused by the loss of active days caused by physical or mental illnesses. Measuring indirect costs will be performed through either one of the three major methods: (1) Human Capital Method, (2) Friction Method, and Willingness to Pay. The last method will be detailed in Section 5.3.

5.3 Stated Preference

Stated preference techniques determine what choice people would make and infer values from the answers. There are several techniques available with a variation of the same theme: contingent valuation, conjoint analysis, and choice modelling.

¹³Unsworth & Petersen, 2016.

¹⁴Unsworth & Petersen, 2016; Jo, 2014.



All stated preference techniques can measure “passive use” values or “existence value” where many people care about issues which will never directly affect them. An example is the existence of species like the Spotted Owl or Blue Whale. Many people derive enjoyment from their existence, or displeasure from their extinction. If an issue never directly affects someone, there are no actions to observe, and therefore revealed preference techniques cannot be used nor can elicit active use values over future events. While RP techniques could be used ex post, decisions must be made before those can be observed. Special attention should be made since hypothetical conditions often raise questions on the reliability of the study.

5.3.1 Contingent Valuation¹⁵

Stated preference techniques rely on asking people about their preferences for a change in the provision of a non-marketed good. Contingent valuation (CV) is a stated preference technique that asks a random sample of people about their willingness to pay to enjoy an environmental improvement (or avoid an environmental deterioration). Willingness to pay (WTP) is the hypothetical payment for an improvement at which price the project would make the individual neither better nor worse off.

It is ‘contingent’¹⁶ because WTP questions are about circumstances that might arise. As it has yet to happen, the condition is still hypothetical. So, value estimates are ‘contingent’ on the circumstances (or the ‘context’ or ‘frame’) presented to respondents. Value estimates are consistent with welfare economic principles, Hicksian’s concepts of compensating surplus (similar to ordinary Consumer Surplus changes).

Steps of a CV study are as follows:

1. **Define the environmental change.** Bio-physical impact/model is an important part of this first step. Output from the bio-physical model becomes input to the valuation exercise.
2. **Design the questionnaire.** Ample time should be set aside for this step. Included in this step is consultation with experts as well as with future respondents. The consultation process is important so that the questionnaire can be accepted by respondents and scientifically correct.
3. **‘Frame’ the issue** by introducing the issue, identifying a potential solution, developing a payment vehicle, asking the WTP question, identifying ‘protests’, and asking demographics of respondents.
4. **Identify the study population,** draw a sample from the population, survey the sample using mail, in-person, telephone, or internet/online surveys.

5. **Code and analyze the data,** usually using cross-sectional models.

6. **Report the results as an input to policy formulation.** In this step, we need to reintegrate the results into the bio-economic model.

Critics on the technique are as follows:

- Strategic bias, respondents will systematically bias their responses to secure their desired outcome – exaggerate their WTP bids in open ended questioning
- Hypothetical bias, respondents do not consider their answers carefully and so WTP bids are not accurate reflections of preferences since questions relate to hypothetical situations
- Payment vehicle bias. For instance, when tax is selected as a payment vehicle, respondents usually react adversely, leading to distorted WTP values and a large number of protests. On the contrary, other payment vehicles, such as environmental levies, donations, management fees for natural areas, and free rider problems that might exist. Scope, differences in quantity or quality of improvement should be reflected in values
- “Yes-saying”, respondents agree to pay no matter the bid amount
- Scope, differences in quantity or quality of improvements should be reflected in values
- Embedding: answers are typically lower if project is later in a queue of valuation questions. Therefore, it is important to remind the budget constraints and other priorities before surveys

CV results could form the basis for compensation settlements if certain procedures are followed, including:

- Dichotomous choice version used
- Follow-ups asking reason for answer
- Scope test undertaken
- Compulsory payment required
- Clearly defined problem with clear information
- Realistic scenario
- Careful pre-testing and focus groups
- Personal interview preferable

5.3.2 Choice Modelling¹⁷

Choice modelling (CM) is a stated preference technique, developed in the environmental context following CV controversy. It was established in the marketing, psychology, and transport economics literatures and known as conjoint analysis, choice experiments. This technique is designed to investigate the trade-offs people are willing to make when confronted with choices. This method is particularly useful when the choices have not yet been confronted. For example:

- If a new mode of MRT or LRT were to be introduced, would people change over from driving their motorcycles/cars?
- If a well-known brand of soap was to change its logo or introduce new scent?

This technique focuses on attributes that characterize a product. By varying the amount of each of the attributes that go together to form the product and observing the choices people make between the alternative products, we can observe the trade-offs made. For instance:

- In the case of a car, how much acceleration are you willing to give up in order to get better fuel consumption?
- In the case of public transport, what reductions in travel time do you need to make up for the comfort of your own car?
- In the environmental context, we have ‘products’ with no markets.

Stages of CM are as follows:

1. **Establish the issue** – ‘at the margin’. This is really important where the estimation focuses on the value of a change in ‘x’, not the absolute value
2. **Develop the attributes of the good from both supply and demand perspectives.** From the supply side, for instance, is the policy makers, their advisers, and scientists. Meanwhile, demand perspective is from those who enjoy the good and who are potential respondents
3. **Estimate the range over which the attributes will vary, given all possible management scenarios**
4. **Compile the experimental design,** where all possible combination of attribute levels were reduced into a fraction of the full factorial to create the choice set attribute levels. With the fraction, all those choice sets may need to be grouped into ‘blocks’ of the experimental design
5. **Questionnaire** which includes: issue/threat, solution, payment possibility, choice sets, follow-up on choice set

¹⁵Hammit & Zhou, 2006; Johnson et al., 2000; Whittington, 2002.

¹⁶occurring or existing only if (certain other circumstances) are the case; dependent on

¹⁷Hynes et al., 2008; Hanley et al, 2001; Blamey et al, 1999, Othman et al., 2004; Wang et al., 2007; Boxall et al., 1996; Blamey et al., 1999.

answers, and socio-demographic

6. **Select the samples** which include beneficiaries, distance dependent
7. **Survey administration** using mail, in-person, telephone, or internet/online surveys
8. **Data coding** to capture respondents' responses to the alternative and associate that answer with the levels of the attributes and the socio-demographic characteristics of the respondent
9. **Data analysis** using Multinomial Logit analysis because there is more than one choice parameter changing across the various choice sets (Equation 3)

$$U_i = ASC + \beta_1 A_1 + \beta_2 A_2 + \dots + \beta_{n+1} S_1 + \beta_{n+2} S_2 + \dots$$

$$U_j = \dots \quad \text{Equation 3}$$

Since one of the β coefficients relate to a monetary cost, the WTP to secure one more unit of a non-marketed, environmental attribute is the ratio of the β coefficients. To estimate the value associated with multiple changes in attribute levels (before and after change), substitute attribute levels into the utility functions and divide by the cost β .

Table 11. Correspondence between TEV and environmental services

ES	Direct use	Indirect use	Option value	Non-use
Provisioning	x		x	
Regulating		x	x	
Cultural	x		x	x

Value transfer uses existing value information of a study site to estimate the value of a new policy site. For instance, estimated value for flood control by an upland forest is based on existing value for a similar upland forest (Figure 20). If the study site and policy site have different attributes or different values of attributes, then all attributes need to be adjusted to accommodate differences in biophysical and socio-economic conditions.

Figure 20. Value Transfer from Study Site to Policy Site

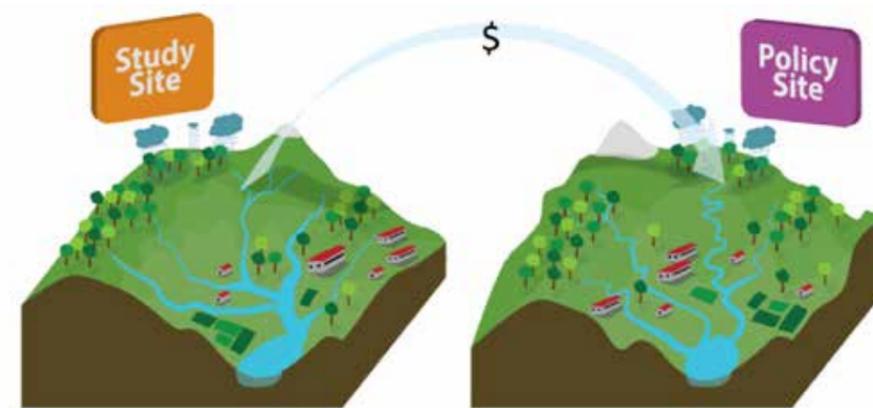
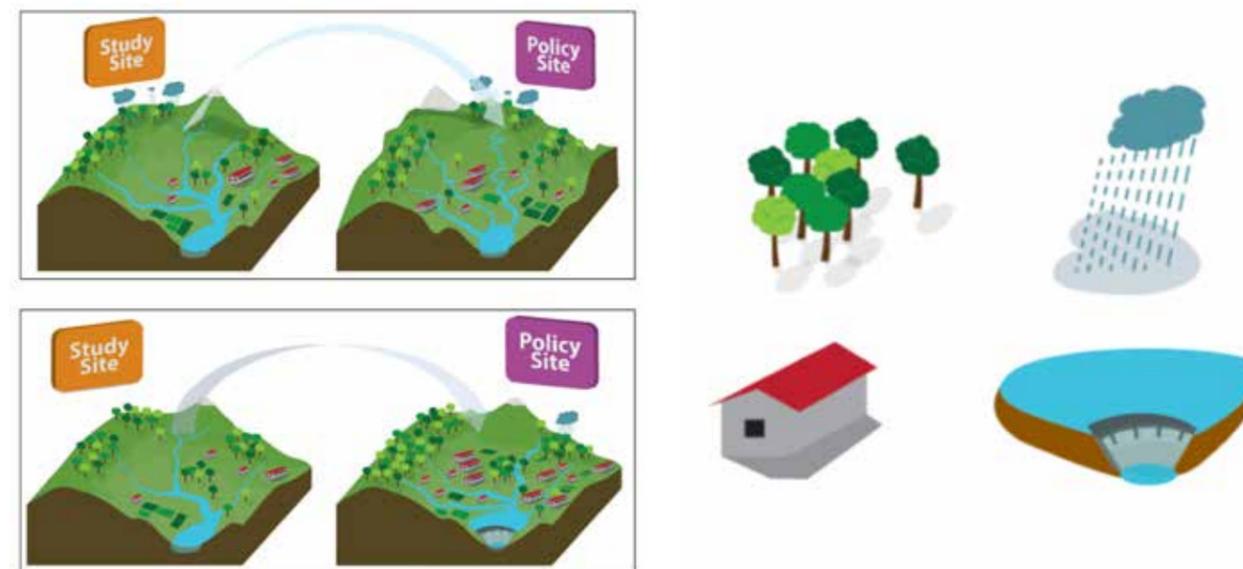


Figure 21. Value Transfer from Study Site to Policy Site with Different Characteristics



There are three available methods: unit value transfer, value function transfer, and meta-analytic value function transfer. For **unit value transfer**, simply: (1) multiply unit value from study site by quantity of environmental goods or services at policy site (study and policy sites should be as similar as possible); and (2) adjust unit values – income and price levels (PPP). For **value function transfer**, we need to establish a function that relates the value of ES to the characteristics of the beneficiaries (Equation 4). Then, characteristics of beneficiaries at the policy site are plugged into the value function.

$$\$/ha = f(\text{population, income, leisure activities}) \quad \text{Equation 4}$$

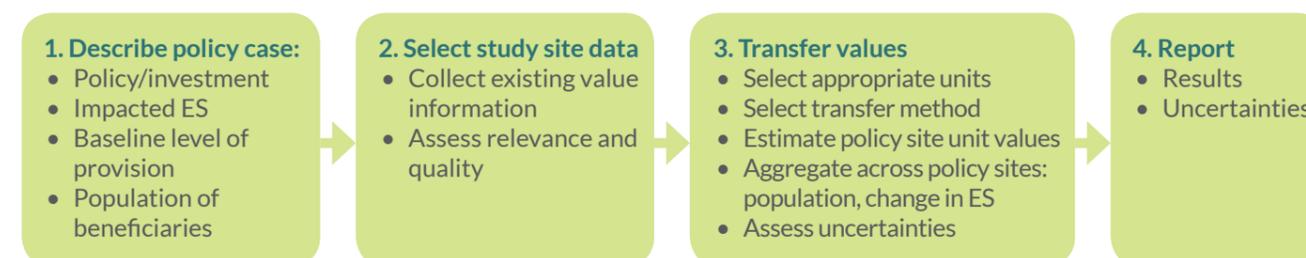
For **meta-analytic value function transfer**, multiple valuation studies to estimate a function related to the value of ES to the characteristics of beneficiaries, study sites, valuation methods are needed. Next, characteristics of the policy site are plugged into the value function to estimate a site-specific value. For all three methods, the same process is applied (Figure 22).

5.4 Benefit Transfer¹⁸

The application of benefit transfer is useful as new primary valuation studies are expensive, time consuming, and not feasible at scale (large areas, multiple sites). It is possible to transfer information on values from existing study sites to policy sites. However, ecosystem values are highly variable so we need to understand how to use all numbers from primary valuation studies and ensure that the transferred values reflect the characteristics of the ecosystem being valued, including environmental services (Table 11). Meta-analysis can be used to summarize existing data and transfer ecosystem specific values from one area to another.

This method is particularly valuable in assessing the effects of pollution, whereby a physical dose-response function from one site or area (including its environmental and health impacts) is applied to a policy site or area, and values are derived according to prices and costs at the policy site (Figure 21).

Figure 22. Steps for Benefit Transfer



¹⁸Brander & Schuyt, 2010.

Units used can be by beneficiaries (\$/household) or ecosystems (\$/ha). When the ecosystem service is being valued, for instance, recreation values are easier to measure per beneficiary, whereas carbon sequestration is easier to measure per unit area. Since benefit transfer relies

on available value information from primary studies and methods used and available information at the policy site (for aggregation), the unit used heavily depends on available previous studies.



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